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EDITORIAL NOTES.

Legislative and Controlling Authorities.

THERE is a division of opinion among the professional gas men of America as to the real advantage of State Public Utility Commissions of which the United States have now had some experience. The President of the American Gas Institute (Mr. W. H. Gartley, the Engineer of the Philadelphia Gas-Works) admitted the existence of the difference of view in the Presidential Address which he recently delivered to the members. With a single exception, all the States of the Union have now these Commissions; and of these twenty-eight have authority to impose regulations on gas companies. Fifteen of them have adopted and published proposed regulations; five others have now formulated similar rules; and the remainder, it may be expected, will follow on. It would be instructive if someone competent to undertake the work would make a comparative investigation of the fifteen sets of regulations already issued, in order to ascertain how far they agree, and where there is divergence the reasons for it.

Any body set up for legislative purposes in connection with industry fails in efficiency if it is unable to deal with the subjects upon which it has to legislate with a technical knowledge of requirements and conditions, and if it takes the narrow view that its functions are to be protective only of one party and hostile to the other. The question of the correct legislative body for special purposes is a most difficult one with which to deal. In our own system of legislation on this side, with ever-changing Parliamentary Select Committees, there is not full legislative efficiency, so far as special industries, such as gas supply, electricity supply, and railways, are concerned. As a rule, the members of the Committees have no technical knowledge; and this means very considerable waste of time in laying before them the information necessary to such appreciation as they can gain as to the particular question on which they are called to adjudicate. Yet there are some people who believe that the Select Committee system is, as a legislative machine, as near perfection as one can get under the circumstances; and we will admit that, generally speaking—occasional prominent exceptions are known—there is sincerity of endeavour to arrive at an honest judgment. On the other hand, if one has a professional tribunal—for example, a committee of gas engineers and managers—there is always the danger in cases of the opinions generated in the past over-riding the new conditions of the present. But there, again, in a reasonable number of professionally trained men as legislators, there is safety; and, on the whole, the weight of legislative competence is, for special and practical purposes, on their side. The other danger (previously referred to), of non-technical legislators, is that they may take a narrow view of their functions, and adopt a preferential attitude towards the public, and treat as hostile those whose enterprise supplies the commodity. This, of course, is a huge mistake. The interests of the two are mutual; and while guarding the interests of the public, such consideration and protection should be given to the suppliers' interests as will cause the enterprise to be attractive to the investing public, whereby the public gets the advantage through the service rendered to it of cheap capital and of the stability which a sound financial enterprise always secures. If the scales of justice are evenly balanced, and there is an evident desire to serve the dual interests, then the legislative body wholly justifies its existence, and is a good member in the system ministering to the commonweal.

It is difficult from a distance to make any conclusive pronouncement as to whether the State Public Utility Commissions of the United States fully meet the requirements of a legislative body for special purposes. From the admission of Mr. Gartley, the opinion of some American gas experts who deem themselves competent judges is that they do not, and that their enactments prove it. Tested by the experience and conditions on this side (which, of course, require to be qualified by the conditions existing on the other side), some of the regulations imposed by the Commissions do not appeal to us as being in the best interests of either gas suppliers or consumers. On the other hand, some are good. Personally, Mr. Gartley believes that "on "the whole" (which expression indicates a qualification lurking in the mind) they do fulfil a good purpose in the system of public utility regulation, inspection, and control. While saying this, our American friend unveils experience which is indicative of instances within his knowledge where capital has not been protected in the desire to make as taut as possible the strings of regulation; and in referring to the Commissions as judicial authorities, he speaks of the necessity of the members of these bodies being "well in-"formed" as to gas manufacture, distribution, and selling, which suggests that the constituent members of the various Commissions (good as they may be in some walks of life) are not all "well informed" in the essentials to arbitrament and enactment upon gas affairs under modern conditions. Again, there is evidently knowledge on the President's part of an injustice done by Commissions as between large and small companies; for he emphasized the point that a State Commission should not yield to the temptation of imposing severe standards of quality upon the more important gas companies while less severe on the smaller ones. That is a distinct error of judicial judgment; for the service to the individual consumer should be on an equal plane whether the company be large or small. Discrimination, of course, is necessary in the matter of local conditions. But reading between the lines of the address, it is patent that the State Commission as constituted, and as worked, does not in instances come up to the ideal of what a legislative and controlling body for special public utilities should be. We have yet to find the ideal body for this purpose.

It must be conceded, however, that there are points in favour of the State Commissions. They are, in the first place, permanent bodies; and this is an advantage when they have become thoroughly acquainted with their functions, and have accrued experience of the special work, as well as of the local circumstances of the several undertakings coming under their jurisdiction. It is better than the ever-changing Select Committees of our Legislature. *Per contra*, between one State Commission and another there is bound to arise disuniformity in prescribed terms, apart from those conditions that may be classed as purely local. Governed by local conditions should be the important duty of prescribing correct standards for individual undertakings. There the State Commission has, if it exercises it, an advantage. In this country, our Parliamentary Select Committees are prone to worship precedent unduly; and it is a very stiff matter to convince them that there are circumstances warranting a departure from precedent. Mr. Gartley alludes in this respect to the value of the State Commissions—that is, the experienced State Commissions—for they are in a position to examine the local conditions of every gas undertaking before imposing any standard of quality. Admittedly, their constitution and accumulating knowledge of local conditions should enable discrimination to be made. But do they discriminate; or do they more or less adhere to the standard of quality laid down in their regulations? Some time since, we commented on the high calorific powers that were being imposed as standards of quality by the State Commissions, which showed that their knowledge was deficient as to high calorific values not necessarily meaning under normal conditions of use high flame temperature for gas consumers. The President mentioned that, within the past two years, the Commissions have been imposing lower values, which action shows a growth of enlightenment on their part, and must assist in the economic working of the gas undertakings. There is the further point that regulation is accompanied by control by the Commissions, which is better for a company—the Commission forming (so to speak) a "Court of Appeal"—than having the local municipal authority set up as supervisors. The gas company, as

Mr. Gartley says, are thus removed from partizan interference. Here, again, permanence of control by the same constituted body should be a factor of beneficial order.

On the whole, therefore, the State Commissions have their advantages and disadvantages; and the perfect body for the special legislative purposes of public utilities has not yet been discovered. There is every reason, however, why the Commissions should look very carefully to the interests of the gas companies, as well as to those of the consumers. The companies can, generally speaking, claim consideration for past good character; for in his address Mr. Gartley states that, as the Commissions have come into being, they have found that the gas business has been conducted in a very intelligent and careful manner, that good quality gas has been maintained, and that there has been good service to the consumers. With so excellent a finding, the need for the State Commissions so far as gas undertakings are concerned does not appear to have been a very substantial one. Business aptitude, and the competition for prosperity and even for existence, are guarding factors to excellent service.

Quality of Sulphate of Ammonia for Export.

We cannot afford—either at the present time with nitrate of soda in active competition, nor in future when Germany resumes her operations in the export market—to spoil our position as exporters of sulphate of ammonia by producing an article which does not come up to the standard that is demanded by customers, and which arrives at its destination in a condition, as regards weight and packing, which is anything but conducive to permanence of business relations. An important letter upon the subject from Mr. D. Milne Watson, the Chairman of the Sulphate of Ammonia Association, and a circular which has been distributed among the members, are published in to-day's issue of the "Journal." Both are in the nature of a warning; and the one emphasizes the other. It is hoped that they will have due and immediate effect, because appeal and caution in the past appear to have been in vain. The matter was one to which Mr. Thomas Milne addressed himself at the Sulphate of Ammonia Conference a year ago. He then urged sulphate of ammonia makers not to produce the commodity under a standard of 25 per cent. of ammonia, about 2½ per cent. of moisture, and not more than ½ per cent. of acid. In Mr. Milne Watson's letter, and in the circulated leaflet, we get the appeal repeated, with the difference that "not more "than 3 per cent. moisture" is mentioned.

What is found is, and it is a serious disadvantage to the sulphate of ammonia export business, that the bulk of the British production is still made and marketed on a basis of 24 per cent. of ammonia, without any mention of moisture and free acid. This condition of things will not do. Nearly all distant consumers have raised their standard from 24 to 25 per cent. ammonia; and when they find this standard is not complied with, that there is a loss in weight of 1 to 3 per cent. through excessive moisture content, and that the bags in which the sulphate of ammonia is packed, through excess of free acid and moisture, have *en route* declined to maintain their integrity, then they become greatly dissatisfied, and do not need further inducement to turn to sources from which they know their requirements can be fulfilled. The losses fall upon the receiver; and he is indisposed to continue to bear them when there is no reason why he should do so. British producers know how much they depend upon the export market; and it will be suicidal on their part not to recognize what is essential in the matter of quality in order to ensure the market for themselves, and not be driven out of it by continued shortsightedness. Directly the war is over, Germany will recommence operations for the development of the export trade. The competition of synthetic ammonia—the production from the nitrogen of the atmosphere—will come into the reckoning again with full force. It will not be surprising, too, to find at the close of the war that Germany will have a decent accumulation of stock with which it will be very pleased to part. The absence of German competition is the opportunity for the British producer to fortify his position abroad; and the best way to do so is to give purchasers the standard material they want, and see that it gets into their hands in good condition and with as little loss of weight as possible. The future of the export market very largely depends upon the action taken in the present. Therefore, the necessity for heeding the warning of Mr. Milne Watson, and complying with the enjoinment contained in both letter and circular.

Adjustment of the Tar Payment Difficulty.

We are pleased that the differences of opinion between the tar distillers and the producers as to the payment for the liquid products and the pitch from tar have been adjusted by conference, through the mediation of the Institution of Gas Engineers. These are times when there must be give-and-take where in the business relations of two parties the war has caused any disruption of ordinary conditions. The war did this in the case of pitch by stopping exports (which have only been resumed to a small extent); and pitch, representing some five-eighths in weight of a ton of tar, is an important element in the transactions taking place between producer and distiller. Naturally, the distillers desired to financially protect themselves as much as possible; but the proposals issued on their behalf soon after war broke out were, in our opinion, weighted more in their own favour (which was only in accord with human nature) than directed to securing equality as between the two parties. To be told that delivery of the tar could only be taken under contracts provided gas undertakings would accept the value of the liquid products (less distillers' working expenses and profits), and leave the pitch entirely over (in the stores of the distillers) until such time as it should be marketed and paid for, was to say the least one-sided, although expense is admittedly incurred in carrying heavy stocks.

Now, however, through conference, conditions have been arrived at which seem, under the circumstances, perfectly fair, and are recommended by the Joint Committee of Producers and Distillers for adoption throughout the United Kingdom. It is not clear whether the conditions may be taken to be binding on all the tar distillers, or whether their adoption is optional by them as by gas undertakings. Of course, any of the latter declining the conditions during the present trouble, unless they can make terms outside them, will simply be left with their tar production on their hands. Every provision appears to be made for the adjustment of any difficulties that may arise, and for the mutual revision of the conditions should this be warranted by circumstances varying from those now prevailing. In the case of sliding-scale contracts, the values of the liquid products are to be fixed monthly, and the producers will receive payment accordingly, with 2s. 6d. per ton on account of pitch, less the usual 2½ per cent. and working expenses. The producers doing business with any one firm of distillers will be promptly dealt with *pro ratâ* in respect of any sales of pitch, with a deduction of the 2s. 6d. paid on account. Under price-fixed contracts, 17s. 6d. per ton is to be paid by the distillers in part payment of the products other than pitch, and part value of the pitch, with adjustments on sales being effected. There are other conditions, but they will be found set out elsewhere [p. 408] in the communication from Mr. Dunn. It is certain that beneath the heading of residual products, the accounts of gas undertakings for the current half year will show a curious (and fortunately exceptional) state of things—exceptional even in face of the year ending June having shown total figures for residuals below those which previously presented so favourable an appearance.

Institution of Civil Engineers and Practical Training.

If there is one thing tolerably certain in connection with engineering, it is that the training of young engineers can never be reduced to rigid rule, for the simple reason that the branches of engineering, the engineering requirements of industries, and the mental capacity of pupils all vary to such a degree that any attempt at co-ordination must end in failure. Yet the question of training is important; and its importance increases with the development of engineering science and practice. In the personal element of engineering is the foundation of future practice and advance; and therefore it is to the benefit of the world that the utmost should be done to find the best intellect for engineering service, and to develop this intellect on the surest lines. The Council of the Institution of Civil Engineers have taken the courses open to them to ascertain whether anything is possible in the way of co-ordinating the training of engineering aspirants. But, as they saw from the conference convened by them in 1911, opinion and conditions are so diverse that co-ordination is altogether out of the question. This conclusion is still further accentuated in a report recently received from the Secretary of the Institution (Dr. J. H. T. Tudsbery), in which is given an account of the proceedings, and the recommendations, of the Special Committee on the Practical Training of Engineers. The

Committee was the outcome of the conference of 1911; and upon it were (among other well-known engineers) Mr. H. E. Jones, Dr. W. C. Unwin, and (the late) Mr. Walter Hunter. One object the Council had in view in appointing the Committee was to get into closer touch with the training arrangements actually in existence at engineering works, and works in the processes of which engineering has a large part, in order the better to define and regularize the conditions of practical training for young engineers likely to seek admission to the ranks of the Institution.

The by-laws of the Institution as to the qualification for election are intended to apply to two classes of young men: (1) Those who take a regular pupilage or apprenticeship, but who do not receive systematic college technical education; and (2) those who take a full three-years' course in a good engineering college, and obtain degrees and diplomas recognized by the Institution as exempting from its associate membership examination, with a shorter period of practical training. These requirements it is well to bear in mind in considering the results of the Committee's investigation. In passing, it is remarked that there is one indication there of the view held by the Institution as a body (with which we agree, but with which some of the individual members of the Institution disagree), that technical training should precede practical training; and there is also, taking primary place, the information that young fellows who have not the advantage of a period of technical training are not debarred from membership of the Institution. We take the opportunity of making this point (though known to us before), inasmuch as there are a large number of engineering pupils in the gas industry who have not had the opportunity of a preliminary training at an engineering college. The reference to the Special Committee did not include any educational matter, but simply the "practical" training of the young engineer, in order to see, firstly, whether any, and if so what, steps could be taken to define more clearly the conditions of practical training in the various branches of the profession, as required by the by-laws; and, secondly, whether any steps could be taken to establish some co-ordination between engineering colleges and engineers and other employers, in order that the practical training of well-educated students might be facilitated.

The Committee were not to be envied their task, which they went about in a methodical and comprehensive manner, with a view to attaining, if possible, the objectives put before them. A preliminary circular of inquiry was so full of proof of discordant practices and individual predilection, that the definition of the conditions of practical training in the various branches of the profession was seen to be an impossibility. But the second matter of the shortening of the practical training period of technically educated young fellows, was one towards which there was more sympathetic leaning. We cannot imagine engineers agreeing, in any way, to the details of the practical training of their pupils, under the routine of their works, being interfered with by the application of general rules. Defying subjection to rule are the several departments of a works through which a pupil has to go, the variation in the importance of the work in the several departments, and the difference in the capacity of the man for becoming the master of the various parts of the operations. For one class of work, as Mr. W. Doig Gibb said (who, with Mr. Stanley H. Jones, was called to give evidence for the gas profession), the pupil might have great aptitude, while for another part of it he might not; and this would regulate his stay in the different departments of the works. The varying circumstances of a works, and the varying order of work that might be running, all go to make the reduction of training to conform with definite laws something beyond practicability. But at the same time, engineers and engineering employers made it quite clear to the Committee that they would favourably consider proposals likely to improve and define more clearly the conditions that should be observed for practical training in the various branches of engineering practice.

However, although the inquiry by the Committee was obviously loaded with so much difficulty in arriving at satisfactory conclusions, and although the Committee did not formulate at any clear-cut conclusions in accordance with the reference, their work was not fruitless. The recommendations they made, and the schedules they prepared, will at all events serve as a guide to the engineering student, in any one of the eight branches of engineering dealt with, as to the character of the knowledge that will be expected of him to gain admission to the Institution; and they will also help engineers in deciding as to the courses of practical training that should be pursued by their pupils. The Committee recommend that the prepared schedules should be furnished to the intending student and others as a guide. But time and area of work must have some relationship; and while the knowledge of all the matters set out in any branch are requisite in engineering practice, the Committee are not in their recommendations oblivious of the fact that, during the term of pupilage, the whole of the subjects from the initial stage to the summit of current knowledge in regard to them, could not become the possession of the student. It is therefore recommended that students should—one would naturally suppose that in the ordinary course of things they would—become acquainted with a portion of the subjects during their pupilage; and when they become candidates for election, then information will be required as to the nature of the experience obtained on the subjects, during practical training, for the guidance of the Committee dealing with the preliminary qualifications of candidates. At the same time, it is clear that the Committee are anxious not to tread on the corns of engineers with pupils; for they wish it to be understood that the schedules shall not imply or involve direction to engineers as to the particular work upon which they may find it desirable to employ their pupils, though to the engineer they will afford a ready means of indicating what range of experience has been obtained. In fact, the engineer will have to mark and certify the schedule, on the pupil becoming a candidate for associate membership of the Institution, to show the work in which the student has had experience under him.

Examining the schedule referring to gas-works, it might, in our opinion, be even a little more comprehensive than it is—at any rate, it is not more comprehensive than it should be for a man claiming, or entitled to, the designation of "gas engineer" as distinct from that of "gas manager." The scheduled heads of work and operations involved in practical gas-engineering training are these: (1) Designing and drawing; (2) estimating; (3) specifying; (4) taking out quantities; (5) structural calculations for iron and steel work, masonry, brickwork, concrete, and timber; (6) surveying by chain and theodolite; (7) levelling; (8) parliamentary plans; (9) testing and inspection of materials of construction; (10) testing and analyzing gas and residual products; (11) fitting-shop; (12) forge; (13) carpenters' shop. Then we have (14) the setting-out and construction of: Excavations, earthworks, retaining-walls, river-walls, wharves, piers, brickwork, masonry, and concrete work, gasholders, retorts, and other gas-works plant. The remainder of the schedule reads: (15) Manufacture of gas; (16) purification; (17) main and service laying; (18) fitting and fixing of meters; and (19) other appliances and apparatus. A curious thing is that while the testing and inspection of materials of construction and the testing and analyzing of gas and residual products are specifically mentioned, nothing is said as to the testing of the raw materials from which the gas is manufactured. The "fitting-shop" is mentioned; but gas engineering now covers a vast space in mechanical engineering, which also remains unmentioned. Another important requirement not referred to is knowledge on the part of the gas engineer of not only gas and steam power but of the generation of electrical energy. River-walls, wharves, and piers are mentioned, but nothing is said as to railway sidings; and while the testing and analyzing of residual products are included, the subject of their working-up is omitted.

One other matter that has come before the Committee is that in some cases (not in all) there is a certain looseness about the terms on which, and the methods by which, the practical training of pupils is conducted, especially where there are no properly drawn indentures, although if pupils are taken under any condition, it should be a matter of honour on the part of the engineer to see that the training is on systematic and studied lines, and circumstanced according to the pupil's ability and bent. What the Committee recommend is that all cases of practical training should be the subject of some agreement or arrangement; and they suggest a form of statement for adoption where no articles or indentures are entered into. These agreements should also be accompanied by statements containing the outline of the heads of the classes of work of which experience might be obtained during the training period. Such a statement would contribute to making clear the position of a pupil as distinct from that of an ordinary assistant. Moreover, the

statement, marked by the master to show what items had been dealt with during the period of training, would be of service to the Council of the Institution, when considering at a later stage the qualifications of candidates for election.

It will have been seen from this comment and review that useful work has been done by the Committee, but that they have failed to completely reach the goals suggested by the reference to them. No one can altogether blame them for this; the conditions being of such a character as defied any general treatment.

The War and Gas and Electricity Business.

There have been warnings that in many cases a decrease of gas consumption must be expected as a result of the working of this half year. Some undertakings—not in towns affected by the new street-lighting regulations and reduced shop illumination—have found that the diminution of consumption that took place early in the war period has not been maintained at the same rate, but that normal conditions have been almost restored. These are fortunates in company with the concerns that have found the effects of the war of rather beneficial nature through the demands upon local industries. But this is not the general tale. However, most gas undertakings will hope, if atmospheric conditions continue favourable, to now pick up something from the heating load, which has grown of recent years so lively a factor in a year's business. Last week for the most part was conducive to a larger consumption through gas-fires, and will help to lessen the extent of the falling-away during preceding weeks. Up North snow was seen early in the week; down South there were fairly heavy frosts on three or four days, on the day of Lord Roberts's funeral there was sleet, and raw cold followed. Gas-fires were lit; and business must have become brisker for new installations. Gas undertakings, like other industries, have to be thankful in these days for small mercies; and gas undertakings blessed with territory in which there are factories working hard and late through the circumstances of the times, have in comparison much for which to be thankful, though probably producing secondary products far in excess of the immediate demand. It is stated by an electrical contemporary that inquiry shows that experience varies in the electricity business; but in the Metropolis, and in several large towns, a diminution of consumption of from 5 to 20 per cent. is reported, as compared with the corresponding weeks of last year.

Patents in War Time.

There have now been heard in what has been named the Patents Court quite a number of applications to "avoid or suspend" enemy patents, under the Act which was recently passed for the purpose of regulating this important industrial question. At the outset, naturally, there was doubt as to what would be the attitude adopted in official quarters on particular points; and this, of course, was an uncertainty which could only be set at rest by seeking decision on individual applications. In connection with the first hearings, the Comptroller-General of Patents gave, as has already been recorded, some indication as to what was likely to be the view taken by those in control. After remarking that it would not be fair to deprive a German patentee of his property, he said that, generally speaking, the recommendation the Court would make would probably be that some kind of licence should be given; and this licence would in all likelihood be subject to a royalty. Now an official notice has been issued for the information of the public, which will be useful to intending applicants, as it sets forth the broad principles on which the Board of Trade will act in dealing with requests for the avoidance or suspension of patents and trade marks under the "Temporary Rules" of this year. With regard to patents, licences will, it is stated, as a general practice be granted, when the applicants fulfil the conditions laid down in the Act, (1) where there is no manufacture in this country under the patent, and also (2) where what manufacture there may be is carried on by a company or firm on behalf of alien enemies resident abroad, and there is any reason to doubt that the manufacture will continue to be carried on, or where it is in the interests of the country that some other manufacture should be started in the British interests. As a rule, suspension of trade marks will only be granted (1) where the trade mark is the name of a patented article, and a licence is granted under the patent protecting it; (2) where it is the only name, or only practicable name, of an article manufactured under an expired patent; or (3) where it is the name, or only practicable name, of an article manufactured in accordance with a known process or a formula which has been published or is well known in trade. Generally speaking, suspension will not be granted in the case of pictorial devices. It is pointed out that, while these principles may be taken as broadly applicable, special cases must, of course, necessarily receive exceptional treatment.

PERSONAL.

Sir W. H. STEPHENSON, the Chairman of the Newcastle-upon-Tyne and Gateshead Gas Company, has been re-elected Chairman of the River Tyne Improvement Commissioners. He has also been elected Chairman, for the twenty-fifth year in succession, of the Finance Committee of the Newcastle Corporation.

It has already been stated in the "JOURNAL" that, owing to the war, the gas-works of the Imperial Continental Gas Association at Hanover and Linden have been put under the control of the municipal authorities. The Director (Mr. William Anderson) being an Englishman, the Corporation have appointed as Director and Manager Herr BURGEMEISTER, formerly manager of a gas-works, but latterly living upon his pension in Hanover.

Mr. S. E. WHITEHEAD, Works Chemist at the Windsor Street Gas-Works, Birmingham, has been successful in obtaining the appointment of Chemist and Draughtsman at the Southport Gas-Works (which was recently advertised in the "JOURNAL"), and enters upon his new duties at the end of this month. He has been in the service of the Birmingham Corporation Gas Department for the past six years, during which time he has been engaged at the Saltley, Nechells, Windsor Street, and Adderley Street works. He has had considerable experience with retort-house, coke-oven, and cyanogen recovery work, and has recently passed the Intermediate Science Examination of the London University.

The appointment of Engineer and Manager to the Bath Gas Company, applications for which were recently asked for by an advertisement in the "JOURNAL," has been secured by Mr. J. WESLEY WHIMSTER, who is at present Assistant-Engineer, under Mr. S. Y. Shoubridge, to the South Suburban Gas Company. Mr. Whimster, who is 34 years of age, went in 1896 to Messrs. Ashmore, Benson, Pease, and Co., of Stockton-on-Tees, with whom he served an engineering apprenticeship, going through the various shops and the drawing office. He left Stockton in 1900, to take up the position of Assistant Engineer and Manager to the Redhill Gas Company, under Mr. Douglas H. Helps, and stayed there until 1903, when he received his present appointment at Sydenham. Mr. Whimster will take up his duties at Bath as from the beginning of the New Year.

Removal of the State Embargo on the Free Sale of Tar in Germany.

At an early stage in the war, the German Government prohibited gas-works from selling tar without a special permit. The works were required to hold stocks for delivery to distilleries for the recovery of fuel oil for the use of the German Navy. It is now reported in the "Journal für Gasbeleuchtung" that during October this restriction was being removed in many cases, and latterly almost the whole make of tar was left available for sale in the ordinary way. Some differences are anticipated to arise between gas-works and their former contractors, who may now refuse to take the tar on the terms originally agreed upon. Since the German naval authorities will probably not consider that gas-works have any claim on them for the purchase of tar after the embargo on its free sale had been removed, the market reporter in our German contemporary recommends gas-works to come to terms with their former contractors. The State request to road authorities in Germany, to refrain from using tar for road-treatment, has also been withdrawn.

Among the wills proved last week were those of Mr. W. P. James, one of the Directors of the Pontypool Gas and Water Company, who left £35,683, and Mr. Robert Wifliamson, of the firm of Williamson and Corder, Limited, of Newcastle-on-Tyne, formerly head of the scientific department of Sadler and Co., of Middlesbrough. He left property of the gross value of £22,359.

Mr. E. E. Rudge, the Secretary of the London Coke Committee, of No. 39, Victoria Street, has forwarded specimens of a series of stamps which have been prepared by the Committee for the purpose of advertising coke on envelopes. The stamps form an excellent method of drawing attention to the advantages of this fuel; and as they are of first-rate design and quality—having been specially engraved on steel plates for the Committee by Messrs. Waterlow Bros. and Layton—there should be a large demand for them. They are available for any gas undertaking, at quite a reasonable figure, on application to the London Coke Committee; and they could also be obtained, by arrangement, from the British Commercial Gas Association.

THE GAS INDUSTRY AND THE WAR.

Under the heading of "The Stimulus of Direct Appeal," on Saturday "The Times" said: "During the week recruiting figures for the London area have been about the average of the past month, although they did not equal the excellent record of last week. The figures would be improved if employers would recognize, as the authorities have recognized, that a direct appeal to their employees would provide just the extra stimulus which induces men to join the Colours. The Directors of the South Metropolitan Gas Company have invited a recruiting officer to address their men; and employers who follow this example would be doing a service to their country."

In a message despatched from Amiens on Saturday, the special correspondent of the "Daily Mail" says that for three-quarters of an hour just before noon last Wednesday the city underwent a miniature bombardment by German aeroplanes. One of the first bombs dropped very close to a gasholder, to which it did considerable damage. A number of the small bullets which the bomb contained penetrated the sheets of the holder, causing an escape of gas, which subsequently became ignited. The firemen, however, succeeded in the dual task of putting out the flames and stopping-up the holes.

According to advices from Holland, the Manager of Oude Tonge Gas-Works has been put into gaol. The gas-works there is really a central plant for providing four villages with gas; being situated on one of the isles of Southern Holland, near Rotterdam. The owners of the plant are a company under a Dutch name; but this is only a Dutch translation of the firm of "Carl Francke," of Bremen. The Manager of the works was also a German. He went to the war as an officer of the reserve, but returned suddenly after a few days at the beginning of the war. His conduct made him suspect in such a manner that the Dutch authorities considered it necessary to inspect the site of the works; and the result was that there was found a bed of concrete between the gasholders of sufficient thickness to carry heavy guns. From this site the waterways between Rotterdam and the North Sea, and also those between Rotterdam and the Scheldt might have been placed under gun-fire. Our correspondent remarks: "Another proof that one cannot be too prudent with 'translated' German firms."

The statement made by the Chairman at the recent half-yearly meeting of the Imperial Continental Gas Association, to the effect that the Hanover works of the Association had been taken over by the Municipality, is confirmed by an announcement in the "Journal für Gasbeleuchtung," which states that, consequent on the war, the English gas-works at Hanover and Linden have been placed under municipal management ever since the 1st of September last. Mr. Anderson, the Manager, being an Englishman, Herr Burgemeister, of Waldhausen, near Hanover, has been appointed by the Corporation as Manager of the gas-works for the duration of the war, as stated in our "Personal" column to-day. He will be responsible for the whole technical control of the gas-works at Hanover and Linden.

Prohibited exports are enumerated in a Proclamation dated the 10th inst., which supersedes all previous Proclamations or Orders in Council. The exportation of the following goods (among others) is prohibited to all destinations: Alcohol, methylic; benzol; carbons suitable for searchlights; coal sacks; coal tar products for use in dye manufacture except aniline oil and aniline salt; cresol and all preparations thereof (including cresylic acid) and nitrocresol; dyes and dyestuffs obtained from coal tar; lead, pig, sheet, or pipe; mercury; nitro-toluol; oil, coal tar and blast-furnace; oil fuel, shale; oil, mineral and lubricating; petroleum, fuel oil and gas oil; petroleum spirit and motor spirit (including "Shell" spirit); toluol.

In the list of goods the export of which is prohibited to all foreign ports in Europe and on the Mediterranean and Black Seas, other than those of France, Russia (except Baltic Ports), Belgium, Spain, and Portugal, are noticed: Aluminium; aluminium alloys; asbestos; copper ore; copper, unwrought or part wrought, all kinds, including unwrought brass, gun-metal, naval brass, and delta metal; engine and boiler packings; iron ore; iron, hæmatite pig; iron pyrites; mica; sulphur; sulphuric acid. The export of tinplates to the neutral countries of Denmark, Holland, and Sweden has been prohibited.

On the initiative of the Chilian Minister at The Hague, an important convention has been concluded which permits the re-establishment of the nitrate trade between Chili and Holland, which had ceased at the beginning of the war. Under this agreement the Dutch Government will become the sole consignee of all nitrate cargoes whose destination is Holland; they having at the same time strictly prohibited the export of nitrates from their territory. This measure will, it is stated, save Dutch agriculture, which annually benefits enormously from the nitrate trade, and will help the revenues of the Chilian State.

In the House of Commons last week, Mr. Touche asked the Home Secretary whether he had received a resolution passed by the Islington Borough Council on the subject of the darkening of London, if he had any information pointing to the effect of the darkening as a cause of street accidents, and whether (in view of the public inconvenience, the loss to shopkeepers, and the perils of the streets) he could say if any early relaxation of the darkening order might be looked for. In reply, Mr. M'Kenna said he had received the Borough Council's representation. He was informed by the Commissioner of Police that the police returns showed no increase in the number of traffic accidents occurring by night. The regulations were made on the advice of the Admiralty, who were responsible for the defence of London against aerial attack. They had already been relaxed so as to allow shops to remain brightly lighted until 6 p.m.; and he would be glad to relax them further as soon as the Admiralty advised him that this could safely be done.

There was issued last Thursday the text of the new Government Bill, which has for its object to amend the Trading with the Enemy Act, 1914. It provides for the appointment by the Board of Trade of a person to act as custodian of enemy property for England and Wales, Scotland, and Ireland respectively [the Public Trustee is to be the custodian for England and Wales], who shall hold any money paid to, and any property vested in, him under the Act until the termination of the war, and shall "thereafter deal with the same in such manner as His Majesty may by Order in Council direct." Dividends, interest, or share of profits which, had a state of war not existed, would have been payable to an enemy, will be payable to the custodian; and all trustees for enemies are, within a month after the passing of the Act, to furnish the custodian with such particulars as he may require. Power is given to a High Court Judge to vest enemy property in the custodian. The assignment of debts, and the like, by enemies is declared invalid; and any person who knowingly pays any such debt will be deemed to be guilty of trading with the enemy. There is provision made in the Bill for the payment into Court of sums due on coupons suspected of being enemy property; and fresh conditions are laid down as to the incorporation of new companies.

Mr. S. P. Thornton, brother of Mr. H. M. Thornton, J.P., has been gazetted Lieutenant of the Tenth Leicesters, and Mr. F. W. Richmond, son of the late Mr. E. W. T. Richmond, also received a commission some few weeks ago as Lieutenant of the First Birmingham Battalion of the Royal Warwickshire Regiment.

The Brighton and Hove General Gas Company have contributed £105 to the Indian Soldiers' Fund, and Messrs. Read Holliday and Sons, Limited, £25 to Princess Mary's Fund.

The employees at the Southport Gas-Works are showing their patriotism in a practical manner; and at the present time eight are serving with the Colours. They will not be losers on this account, for arrangements have been made under which they will receive full wages, less Army pay and allowances, during the time they are away; and when they are at liberty to return to work, they will find that their places have been kept open for them. The officials and workmen who remain behind are making weekly subscriptions to the local fund, according to a fixed scale on salary or wages received. It may be stated that since the war began the Gas Department have fixed extra gas apparatus at two recruiting offices and several houses used by officers and men—this being done without any charge.

Twenty employees of the Guildford Gas Company are serving with the Forces; and their situations are being kept open for them, and various sums allowed to their wives. The Company have subscribed to the local relief fund, of which the Chairman (Mr. F. Smallpiece) is the Treasurer, and have arranged to fit up several buildings for Red Cross work when required. In addition, one of the Directors has been assisting to make a house-to-house canvass, with the object of ascertaining what amount of distress exists. The Secretary (Mr. William Titley) is a member of the local recruiting Committee.

The 26 employees of the Preston Gas Company who have joined the Colours have been promised re-employment on the termination of the war; and in the meanwhile weekly allowances are being made to their wives and families. As already reported in the "JOURNAL," the shareholders voted £200 to the National Relief Fund, to which also the staff and employees are making weekly contributions. The Company have fitted gas-boilers and other apparatus at local canteens for the comfort of soldiers.

At the last meeting of the Oldham Electricity Committee, Mr. Stanbury questioned the payment of an account of £91 to what he said was a German firm. He wanted to know what they were doing, as, he said, the Gas Committee had stopped business with the firm. It seemed inconsistent that one Committee should deal with the firm referred to, and not another. The point of his argument was whether they, as a Corporation, were continuing to trade with the firm. An assurance was given to the members that all new tenders were scrutinized, and particulars asked for when any doubt arose.

QUALITY OF SULPHATE OF AMMONIA FOR EXPORT.

THE Chairman of the Sulphate of Ammonia Association (Mr. D. Milne Watson) sends for publication the following letter and leaflet, which have been circulated among the members.

84, *Horseferry Road, Westminster, S.W.*,
November, 1914.

Dear Sir,—As the selling branch is now commencing operations, it is right that the attention of members should be drawn to the importance of producing regularly a good high-testing sulphate of ammonia.

For export purposes, sulphate should contain 24¾ per cent. to 25 per cent. of ammonia and not over 3 per cent. of moisture, nor more than ½ per cent. of free acid.

The following are the principal reasons why high-grade sulphate is necessary for export:—

(1) The majority of the foreign countries who are large consumers now demand a standard of 25 per cent.
(2) The Germans only export sulphate guaranteed at 25 per cent.
(3) A large quantity of British sulphate is excluded from the best markets owing to its low test.
(4) Sulphate which contains more than about 3 per cent. of moisture, and ½ per cent. of free acid, has a disastrous effect on the bags in which it is exported; and there is a heavy loss in weight at the point of destination.
(5) Unsatisfactory condition on arrival leads to complaints and disputes between exporters, and importers, and inclines the consumer to buy nitrate of soda, which is sold on delivered weight.

Great Britain is still the largest exporter of sulphate; but it must not be forgotten that, when the war is over, the Germans will, no doubt, resume their make of sulphate direct from the air, by which means they are able indefinitely to increase their quantity for export.

Seeing that the Germans are temporarily out of the foreign markets, there is an excellent opportunity for British sulphate to recapture completely those markets which were giving German sulphate a preference. It is all the more desirable that the British sulphate should be of the highest quality, so that it may retain these markets when the Germans can again compete.

I feel sure that the foregoing reasons will appeal to members of the Association, and that they will do their utmost to manufacture sulphate of ammonia of a high quality, as this will make the task of increasing our export trade much easier.

A leaflet which deals in detail with the question of quality is enclosed herewith.

(Signed) D. MILNE WATSON,
Chairman of the Association.

[ENCLOSURE.]

QUALITY OF SULPHATE OF AMMONIA.

Members will recollect the circumstances which gave impetus to the idea of forming a British Sulphate of Ammonia Manufacturers' Association. Briefly, they were the disastrous effect on prices produced by the struggle between the German Syndicate and the Badische Aniline Fabrik last autumn; the entry of the Germans into the overseas market on a much larger scale than before; and the knowledge that this invasion of markets which had previously been almost exclusively British preserves, would be continued on a larger scale in future.

The Sulphate of Ammonia Manufacturers' Association is now merged in the selling branch of the Sulphate of Ammonia Association, and, through its members, already represents a large proportion of the total output of the United Kingdom. There is no doubt that membership will increase as soon as manufacturers realize the strength which combination confers.

But combination alone is not enough. No amount of combination will make the world buy what it does not want, when others are offering it what it does want. And it is unfortunately true that the United Kingdom still turns out a large amount of sulphate of ammonia which is not of sufficiently good quality.

For many years the British manufacturer had a virtual monopoly of the export market for sulphate of ammonia. He found it too expensive to market his production himself in foreign lands; and the export trade thus came into the hands of the merchant-dealer. The result has been—at any rate as far as quality is concerned—that the manufacturer has not followed overseas developments as closely as the dealer has been compelled to do; the consequence being an ever-increasing difference between the guarantees given by manufacturers and those demanded by consumers, resulting firstly in the imposition on dealers of proportionately greater speculative risks; and, secondly, in a preference being given by the consumers to foreign competitors who give higher guarantees.

The great feature in the sulphate of ammonia export market in recent years has been the raising of the standard demanded, from 24 per cent. to 25 per cent. ammonia, owing to pressure on the part of the consumer.

The consumer has become more scientific in his ways. He has begun to work out prices in terms of units of nitrogen; he calculates the saving in freight gained when impurities such as moisture and free acid are reduced to a minimum. He has found by bitter experience, when he has bought sulphate of ammonia testing less than 24½ per cent. ammonia, and containing high percentages of moisture and free acid, that, owing to the disastrous effect of the moisture and free acid on the bags, he has always had to reckon on some loss of weight, varying from 1 per cent. to 3 per cent., and occasionally even more.

On the other hand, by buying well-dried sulphate of ammonia, testing about 25 per cent. with not more than ½ per cent. free acid, this loss in weight can largely be avoided.

The practical result of these discoveries is that America, Java, Germany, Mauritius, the West Indies, and to a large extent Holland, buy 25 per cent. (or 20½ per cent. nitrogen), while the largest Japanese buyers insist on a guarantee of not more than 3 per cent. moisture and ½ per cent. free acid.

Now the bulk of British sulphate of ammonia is still sold by makers on a guarantee of 24 per cent., with no mention either of moisture or of free acid. It is true that a very large proportion of this sulphate of ammonia actually tests 24½ per cent. or over. But the buyer at present has no legal claim against the maker provided the latter delivers 24 per cent. ammonia, even though the contents of moisture and free acid be 4 per cent. or 5 per cent. and 1 per cent. respectively. A shipment of such an analysis (24 per cent. ammonia, 4 per cent. moisture, 1 per cent. free acid) to Japan, *e.g.*, would be practically certain to arrive in bulk, for the moisture and free acid would rot even the strongest new double bags obtainable. Even well-dried sulphate of ammonia with a high content of ammonia or nitrogen will not stand a long voyage if the free acid exceeds ½ per cent. to ¾ per cent.

It is clear that if the United Kingdom is to hold its own in the world's markets, both the quality and the guarantees given must be raised.

The Germans have realized that consumers are demanding, and will continue more and more to press for, 25 per cent.; *and they therefore export only* 25 per cent. America, too, sells on a basis of 25 per cent.

It must be borne in mind that the German production for 1914 was estimated at about 550,000 tons, and that this figure will probably increase year by year after the war. American production is also increasing.

In order to meet German competition, British manufacturers must be in a position to supply consumers with a quality equal to the German quality.

It is therefore earnestly hoped that manufacturers will do their utmost to improve the quality, and to make sulphate of ammonia testing from 24¾ to 25 per cent. ammonia, with not over 3 per cent. moisture and not more than ½ per cent. free acid, adopting, if possible, 25 per cent. as a selling basis.

The inherent advantages of a 25 per cent. standard have been indicated above. Its adoption by British manufacturers generally will enable them to re-enter many markets from which a large proportion of British sulphate is already, or in course of being, excluded.

Apart from this, however, it is felt that the adoption of a high standard will act as a powerful means of propaganda in favour of sulphate of ammonia by securing to the consumer those advantages which will determine him to prefer sulphate to other nitrogenous manures.

TAR TRANSACTIONS DURING THE WAR.

A COPY of the subjoined conditions for deliveries of, and payments for, tar during the war crisis has been forwarded by Mr. Walter T. Dunn, the Secretary of the Institution of Gas Engineers. The conditions have been agreed to by the Joint Committee arranged by the Institution representing tar producers and tar distillers, and are recommended for adoption throughout the United Kingdom.

I.—Sliding-Scale Contracts.

(*a*) The tar distillers and gas authorities, or their valuers, to meet each month as usual, to fix the values of the products other than pitch.

(*b*) The tar distillers to pay to the tar producers the aggregate value of such products, *plus* 2s. 6d. per ton of tar on account, for the pitch, less the usual 2½ per cent. and working expenses.

(*c*) All pitch made and delivered since Aug. 1, 1914, by individual tar distillers during the period of crisis to be paid for each month *pro ratâ* to the deliveries of tar of each producer; allowance being made for the 2s. 6d. per ton of tar already paid on account.

(*d*) On the resumption of the export of pitch at present suspended, the value of such pitch delivered each month to be settled by the usual arbitrators, and the value ascertained each month to be added to the tar values and paid by the tar distillers to the tar producers, less the 2s. 6d. per ton of tar already paid on account.

(*e*) The additional cost (if any) incurred by the removal and storage of pitch to be equally borne by the tar producers and the tar distillers.

II.—Price-Fixed Contracts.

(*a*) The sum of 17s. 6d. per ton of tar to be paid by the distillers and accepted by the producers in part payment as the value of products other than pitch and part value of pitch.

(*b*) The balance to be paid as, and when, the pitch is delivered by the distillers *pro ratâ* to the deliveries of tar of each producer.

III.—Minimum Price of Pitch.

A Committee has been appointed to consider and, if advisable, to fix prices from time to time.

IV.—Revision of Conditions.

It is understood that these conditions may be amended by mutual arrangement between the tar producers' committee and the tar distillers from time to time.

COAL AND COKE SUPPLIES IN GERMANY.

The market report in the "Journal für Gasbeleuchtung" last to hand states that in September 5,510,000 metric tons of coal were raised from the pits of the Rhenish Westphalian Coal Syndicate, as compared with 8,561,000 metric tons in September last year. The output of coke in the same month was 871,060 metric tons, compared with 1,706,990 tons in September, 1913. There was also a considerable reduction in the output of briquettes. The production of coal in October is estimated to have been approximately 55 per cent. of the normal.

There is great scarcity of anthracite through the cessation of imports from England, which has been intensified by the prohibition of exports from the Limburg pits in Holland, the production of which normally goes to a great extent to Germany. Large coal of coking grade in Westphalia is now reserved exclusively for the Navy. The output of Saar coal is about one-third of the normal. The export of coal from England to North Germany and Austria-Hungary, which amounted last year to over 10 million tons, is, of course, now cut-off. The Upper Silesian mines, which supply the Baltic provinces and Central Germany, including Berlin, have been hampered by lack of waggons and insufficient labour, and have only been able to meet about three-quarters of the demand. Consequently, the export to Austria-Hungary has been reduced as much as possible. In North-West Bohemia the demand for coal is about 80 per cent. of the normal; and in the first half of October the requirements were not nearly met, owing to diminished transport facilities.

WAR CONDITIONS IN FRENCH GAS-WORKS.

It is scarcely to be supposed that, in the troublous times in which we are living, the thoughts of managers of gas undertakings in this country should not be turned to their colleagues on the Continent, especially that portion of it which is now suffering from the ravages of war. It may therefore not be uninteresting to give a few particulars, for which we are indebted to an esteemed correspondent, of the steps which have been taken to overcome the difficulties experienced in carrying on the manufacture of gas. Readers of the "Journal" may possibly remember that associated with the Société Technique du Gaz en France is an organization called the Syndicat Professionnel de l'Industrie du Gaz, the object of which is to deal with questions that are rather outside the purview of the other body. Since the commencement of hostilities, the Syndicate has enlarged the sphere of its activities, and, by all the means in its power, has come to the assistance of gas undertakings. Under the direction of the President, M. Henri Marquisan, with the assistance of the able Secretary, M. Ph. Delahaye, and the co-operation of MM. Delaporte and Decluy, the Engineer and Manager of the French Coke Committee, there has been organized, in the face of very great difficulty, in Paris and Bordeaux, a very important service of information and supply. As the result of the efforts of the Syndicate there have been published lists of the *personnel* who have been mobilized, with indications of the places in military occupation, in order to enable the gas fraternity to ascertain the whereabouts of its members, and to render them assistance in case of need. With these introductory observations explanatory of the position, we will leave our correspondent to speak for himself.

Gas-works, he says, constitute a public service of great importance, not only because they ensure the lighting of the roads, but also that of the hospitals, barracks, and military establishments. In some cases, the cooking in the hospitals is done by gas, and on almost all railway lines the carriages are lighted by means of incandescent burners. Consequently, the sudden stoppage of gas-works would cause very great disturbance and considerable inconvenience, and would hamper commerce and affect the very life of the people. The mobilization order brought great trouble to all French gas-works, inasmuch as many of the men were called to join the Colours in the early days of August. With the help of Reservists and of "out-of-works" belonging to other industries, it was found possible to organize, after a fashion, shifts of stokers, and so meet requirements. The calling-up of fresh troops would, however, have taken from gas-works all the labour which had been brought together with so much difficulty, if the Syndicate had not been able to obtain from the Minister of War a number of the called-up men who were not immediately required, and whose assistance was so indispensable for the carrying-on of gas undertakings. With the same object in view, the Syndicate established a bureau for the registration of the names of workmen seeking employment.

Coal tar being necessary for the manufacture of products entering into the composition of explosives, its exportation was interdicted by a Ministerial decree of the 15th of October, and the war authorities requisitioned it. There again the Syndicate intervened. It instituted an inquiry as to the quantity of tar available, the number of works treating it, the methods of its disposal, &c.; and took steps to relieve works which were encumbered with stocks, and hampered by the difficulty of getting rid of them.

The most important question which has occupied the Syndicate has been the replenishment of the coal-stores. At the outbreak of war, the French Government bought in England 100,000 tons of gas coal of excellent quality, which was delivered in the ports of Dieppe, St. Nazaire, and Bordeaux during the second fortnight in August. The quantity named has, however, been partially used up; and this system of keeping up the supply having given rise to some dissatisfaction, the Syndicate promptly took the necessary steps for stocking the works in the east, west, south, and even the centre of France, the store of coal in which was getting very low. This was a very delicate operation, as it meant not only the purchase of considerable quantities of coal—principally Lancashire—its transport to France, and its discharge at the ports where the plant had been appropriated by the military authorities and there was great scarcity of labour, but also its conveyance by rail, with the consent and co-operation of the committees controlling the lines, to the respective gas-works requiring it. Notwithstanding all these difficulties, the replenishment of the coal-stores will, it appears, be successfully accomplished, thanks to the devoted labours of the directors of the Syndicate, who have done everything possible to assist their colleagues. Their action certainly deserves all praise.

THE INCREASE OF GAS-SALES A NECESSITY FOR NATIONAL DEFENCE IN GERMANY.

An esteemed Continental correspondent communicates the following article on the present gas position in Germany.

The "German Gas Promotion Centre" has issued a "Bulletin" concerning gas sales and national defence, the principal features of which may well be summarized for your English readers. War has driven all other interests into the background; and, therefore, it is understandable that the promotion of gas sales has also practically come to a standstill. Nevertheless it is essential for the gas industry to promote gas sales as much as possible.

As was foreseen at the beginning of the hostilities, the "Bulletin" points out, the import of petroleum into Germany has entirely stopped so far as American oil is concerned, and has considerably decreased for the Galician and Roumanian oil. But as American kerosene is chiefly used, it follows that at the present time stocks of petroleum have become very small. Owing to this, the German-American Petroleum Company [D.A.P.A.G.], the "Olex," and the Petroleum Sales Company, have all raised the retail price of petroleum by 3 marks per 100 kilogrammes—*i.e.*, from 20 to 23 marks. The first of these Companies has also given notice to its regular buyers of large quantities, that none of them will be allowed a supply of more than one-half the quantity they had last winter. Everyone knows that there is in most cases no illuminant except kerosene for those that live in the country; consequently the stocks of this oil ought to be kept in reserve for this class of people. It is therefore necessary that even in the smallest town, where there is gas supplied, all illumination of interiors and all cooking of meals must be made with gas. Even should the war last a long time, gas will be the sole illuminant of which there will be a regular supply.

An approximate estimate is that there is a decrease in gas sales of about 10 per cent. as compared with the sales in the spring of this year. It is in the interest of the country that this decrease should soon turn to an increase; for agriculture in Germany is in great need of nitrogen. Up to the beginning of the war, one-half of the requirement for nitrogen-fertilizers was covered by Chile saltpetre. But as the import of this product has been totally prohibited, German agriculture is dependent on inland production only, and more specially on the production of sulphate of ammonia. Every increase in the production of this salt is of great value. Not only, however, is the destructive distillation of coal for the production of gas of importance for feeding the German people by producing fertilizers in the form of ammonia salts, it is also needed for war purposes, as from coal tar are distilled the tar oils wanted by the navy for its ships.

It is therefore an inevitable obligation, the circular emphatically points out, for all communities to promote the sale of gas in such a manner—be it by slot meters or other methods—that their customers have at the end of every month only to pay for the gas they have consumed.

The lower classes of the nation have no money to pay away at this time for the cost of gas installations, cookers, and other appliances. But the municipalities and even private companies have the means for doing so now as well as before the war. And therefore it is obligatory for them to use these means for the introduction of gas in all dwellings. This gives a double advantage. Firstly the sale of gas rises, and together with it the assets and also the profits of the gas-works; secondly the installations will prove rentable even in time of peace, and furthermore the metal industry will have its profits.

In accordance with this declaration, our correspondent concludes, the corporations of many large German towns have decided to arrange for free installations in all houses where up to the present time petroleum only has been used.

It may be remembered that Mr. Samuel Spencer, the Chairman of the Colonial Gas Association, Limited, was unable to preside at the meeting of the Association on the 3rd inst., owing to the serious illness of his wife. Mr. Spencer's many friends in the gas profession will, with us, regret to learn that the illness had a fatal termination on the 15th inst.

DARLINGTON SOLELY SUPPLIED WITH GAS FROM CONTINUOUS VERTICALS.

Installation of the Glover-West Vertical Retort System and Dempster and Sons' Telpher Plant.

PROBABLY there is not another town in this country with a gas output last financial year of 410 million cubic feet that can boast, as Darlington can do to-day, that it is being entirely supplied with gas from continuous vertical retorts. The fact is certainly a very interesting one in connection with the gas developments of the times.

THE OPPORTUNITIES OF PROGRESS AND OLD UNECONOMY.

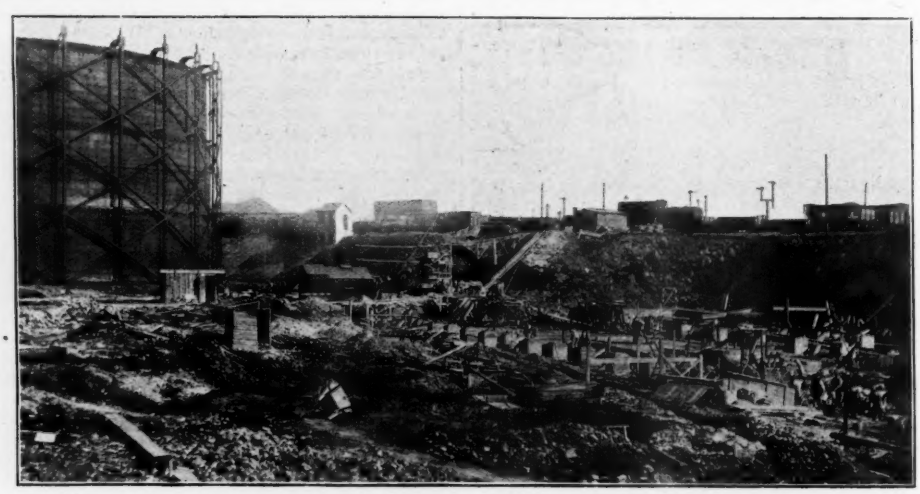
Inspection of the Darlington Corporation Gas-Works and the old conditions shows us that Mr. Frank P. Tarratt, the Engineer and Manager, had a fine opportunity of doing a good piece of work for the Gas Department; and backed by a Committee of excellent men of business (headed by the Chairman, Alderman T. M. Barron), he has taken full advantage of the opportunity. He had, however, to wait for it, until consumption and prospects enabled action to be taken; but the delay has conferred the benefit of all the improvements and the accrued experience with new types of plant. The consumption of gas in Darlington is now double what it was at the time of Mr. Tarratt's advent there some sixteen years ago; and the time arrived when it was imperative that the future should be legislated for in the matter of additional plant. The choice was between the extension of the old retort plant, or making a drastic change and building practically new works on a fresh part of the Corporation land adjoining the old works. To the latter scheme, the Engineer was urged by the uneconomical conditions under which the old plant was operating. There were, and they are still standing, but are not in use to-day, two retort-houses on the old site—one is in one part of the works, the other is located some little distance away. The older house of the two contains eight settings of seven retorts, which were hand-stoked and direct-fired. The other house, which was known as No. 1, contains twelve beds of horizontal throughs, on the regenerative principle, and is equipped with De Brouwer machinery—being equal to a make of 1¼ million cubic feet of gas a day. The direct-fired house was then the stand-by to No. 1 house; and last winter the whole of the retorts in both had to be requisitioned to deal with the maximum demand. It was not a comfortable position. The direct-fired house is now derelict, and will be dealt with as is deemed advisable; while No. 1 house becomes the stand-by to the new continuous vertical retort-house. But it is a question whether, beyond having it available for safety, it will at any time be called into any considerable service, because the economy of the new plant (which is equal to the winter's requirements) will forbid. It was not that the plant in No. 1 house was in itself uneconomical, as that the position of the house rendered over-all costs heavy, owing to the difficulty of handling material. In the case of the old direct-fired retort-house, the coal had to be carted daily, and had to be dealt with by manual labour. In the case of No. 1 house, conditions were rather more favourable, and the coal, from the old railway sidings, was handled in the house by a band conveyor. As regards the coke, it had to be wheeled into the yard by barrows; and so the cost for storage was excessive. Reducing the position to comparative figures: With the direct-fired house, the carbonizing costs worked out to approximately 3s. 3d. per ton; with the No. 1 house, machine worked (but manual labour for coke), to about 2s. per ton. On the new site, through location and plant, the costs, Mr. Tarratt calculates, will come down to about half of the last-named figure—everything in, including coal and coke handling. Dealing with about 35,000 tons of coal per annum, the saving—due to the carbonizing costs being reduced to the lowest possible figure, and to the cheap handling of the raw and spent material—will, it is estimated, pay the interest and liquidation charges upon the money expended, and thus, given normal times, the net profit available for disposal will be unaffected.

WHAT THE NEW SCHEME EMBRACES.

The money spent on the new site, from the heavy work entailed in preparing it to the completed plant and work as we are describing it to-day, amounts to about £50,000. Generally outlined, the plant includes an overhead railway siding with weigh-house and machine, railway gantries in the new coal-store, which is capable of accommodating 3000 tons of coal, new retort-house, Glover-West vertical retort plant consisting of eight settings of eight retorts of 2 million cubic feet daily capacity, R. & J. Dempster's water-tube condensers, Robert Dempster and Sons' telpher plant for handling the coke—conveying it to the screens and overhead hoppers, or for filling trucks on the overhead railway, or storing it in the yard—and tar and liquor tank. Thus we have here a complete manufacturing unit. At present, the old exhausters, purifying plant, and everything else on the old site are being employed for dealing with the gas from the new installation; but the scheme contemplates the eventual concentration of this plant on the new site, so as to make there a complete works.

THE SITE AND PRELIMINARY WORK.

Taken as a whole, the Darlington site is one of the most peculiar and shapeless that we have ever come across. It is really in three sections, being intersected in one direction by a river, and in another direction by the railway. But good use has now been made of the railway, in concentrating the new manufacturing plant on what is known as the Albert Road site. The area of the entire gas-works lands is about 10 acres, of which the now developed new part (which has been the property of the Corporation some twenty years) represents 4½ acres.



THE RETORT-HOUSE AND COAL-STORE FOUNDATIONS.

When the site was taken in hand with a view to the carrying out of the new scheme (the Engineer has indeed made a vast change from the original ruggedness), the Corporation acquired from the North-Eastern Railway Company a portion of their railway embankment. This involved the removal of an enormous amount of material before the foundations for the coal-store could be put in. Prior to this, however, the low-lying part of the land by the river necessitated the construction of a heavy river wall; and there the spoil from the excavation for the tank of the holder erected on the new site was used for levelling purposes. At the part of the site now occupied by the retort-house, the land was also at a low level; and so advantage was taken of this for the foundations of the bench. Where the material was removed from the railway embankment, and for the support of the high-level railway, retaining-walls (26 feet high above the ground level, and very substantial) were built. Then, in order to avoid excavating to an unreasonable depth, the coke screens and hoppers have been accommodated on a reinforced concrete raft. For the foundations for the telpher trestles, it was necessary to go down some 12 feet. Messrs. Blackett and Son, of Darlington, were the contractors for the coal-store, the retaining-walls, and the foundation work.

THE RAILWAY SIDINGS AND WEIGHBRIDGE.

The foregoing is an indication of the character of the preliminary work necessitated by the site. To start the description of

THE COAL-STORE AND RETORT-HOUSE UNDER CONSTRUCTION.

the work and new plant as now seen in operation, commencement should be made with the railway sidings. On the old site there were sidings; but the sidings on the new site are entirely new—the work on their own land having been carried out by the North-Eastern Railway Company, and on the Corporation land by Messrs. Thomas Summerson and Son, Limited, of Darlington. There is "standage" on the sidings for about 22 waggons. At the point where the waggons pass from the Railway Company's land on to that of the Corporation, there is a 40-ton weighbridge (by Pooley and Sons) and office.

The Coal-Store.

The new coal-store is 142 feet long by 42 ft. 6 in. in width. It will, as previously mentioned, accommodate, in the depth of 26 feet below the high-level rails, about 3000 tons of coal. Above the elevated rail level to the spring of the roof of the store the height is 18 ft. 6 in. The walls, which have concrete foundations, are built, up to a height of 21 feet, of concrete faced with red brick; and above this height common bricks have been used, also faced with red bricks. At the sidings end of the store, and above the elevated rails, there are arched openings, 10 ft. 11 in. by 15 ft. 2 in.; and, with such openings as these, the largest size truck can be brought in without difficulty—in fact, eight 20-ton trucks will approximately meet a day's requirements of the new Glover-West plant when in full use. The plans for the new site have been so plotted by Mr. Tarratt that the present retort-house can be duplicated in continuous line. In this event, the coal-store would not be extended; but the railway gantry would be lengthened to meet the needs of the new house. One point as to the lower part of the store. It has been divided into three parts by expanded steel concrete partitions, 14 feet high, so that any part can be isolated should spontaneous combustion occur. Openings have also been left in the wall between the retort-house and the coal-store, so that access can be readily obtained, in the event of fire, through the retort-house, and the mischief be promptly tackled. The railway gantry in the coal-store and the roof to the store were the work of the Whessoe Foundry Company, who, it may also be here mentioned, supplied the steel foul main for the retort-house, as well as the cast-iron tar and liquor tank.

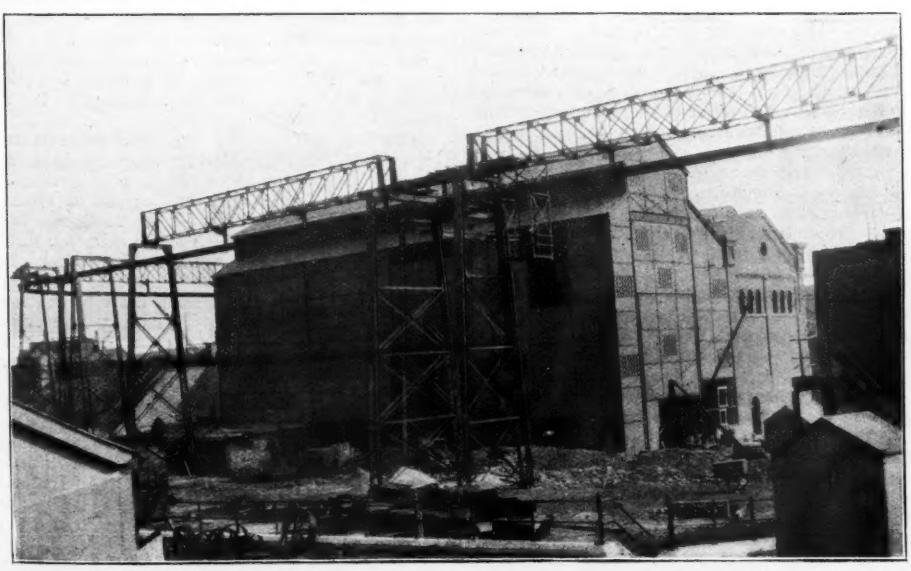
The Retort-House.

The retort-house has in every way been designed with an eye to practical convenience. It is of the now usual type of steel-framed structure—I steel stanchions, braced by horizontal steel stanchions—with 4½-inch brick panels, honeycombed for the purpose of admitting light and for ventilation. The steel work is stayed to the buckstay and girder-work of the retort-bench and bunkers. The roof is of slates fastened to angle-steel purlins. The house is in perfect harmony with the coal-store. In its construction the same type bricks have been employed; and although there is no relief in the way of stone or blue-brick courses, the clean-cut bricks, the arched, circular, and other openings, and the panelling, give combined an attractive, neat, and substantial appearance to the buildings. The length of the retort-house is 141 ft. 6 in.; the width, 51 feet; the height, at the highest point of the eaves, 51 feet; and to the top of the louvre, 75 feet. Internally, it is noticed that ample room—some 10 feet—has been left for the work of clinkering the furnaces. The house is well ventilated by open louvres running the full length of the roof over the coal-bunkers; and, for aiding the work of ventilation, openings have been left in the upper part of the wall partitioning the house from the coal-store. As to lighting during the day time, this is good—a line of patent glazing forming part of the roof on one side the full length of the house. In every quarter, the Glover-West plant is accessible by stairways, and ample platforms, all fitted with hand rails.

The house formed, with the whole of the retort and accessory plant, the contract of West's Gas Improvement Company, Ltd.

Details of the Retort-Settings.

Turning to the vertical retort bench, in every part is seen the excellent construction of West's Gas Improvement Company, and



THE RETORT-HOUSE, COKE PLANT, &c., UNDER CONSTRUCTION.

the consideration given by them to detail. The bench contains 64 retorts, disposed in eight settings of eights, and arranged in units of four retorts—that is to say, each setting is divided so that only one-half the retorts in the setting need be under fire should the total output of the setting not be required. The normal capacity of the plant, as previously stated, is 2 million cubic feet per twenty-four hours.

Now to go rather more fully into the details of the bench. It is supported on brick piers of hard engineering bricks, and rests on a solid block foundation of concrete, 8 ft. 6 in. thick, below the floor-level of the house. These piers are so spaced as to allow ample passing from both sides of the bench and at the ends where the coke-waggons are drawn out.

The main retort-bench brickwork is constructed of fire-brick division and outer walls, with red brick end piers. As introduced by West's Gas Improvement Company in all installations of the Glover-West retorts, there is a transverse cavity in the division walls for providing for the longitudinal expansion of the settings when they are heated-up. The whole is strongly braced by buck-stays of 18 in. by 7 in. I section, with horizontal and cross-tie girders of 8 in. by 5 in. and 8 in. by 4 in. steel I section, cleated to the buckstays. At the base line of the setting, the end buck-stays are attached to the line of horizontal bracing at this point; the end buckstays at the level of the top of the bench being connected by tie-rods of 2½ inches diameter—the whole forming a very substantially braced structure.

The retorts are moulded, and are 21 feet long; the cross sectional dimensions being 33 in. by 8 in. at the top, enlarging to 39 in. by 18½ in. at the base. Each setting has its own chimney, thus enabling it to be under separate chimney control—another special feature of the Glover-West plants.

Each setting has also its own producer, which in this installation is of the stepped grate type with double furnace doors having primary-air inlets, with an adjustable slide fitted to each inlet. The ash-pan is of steel plate, fitted with an overflow-pipe; and there is a water supply to the grate-bars. The producers are cleaned from the ground level. The charging-door of the producer on the charging-stage is circular, and is fitted with a pressed-steel lid, which can be readily lifted. The producers are strongly braced by steel angles and channels. The settings are adequately mounted with inspection and sight-boxes, in order that each chamber and the dampers can be readily attended to. Ample staircases and platforms are provided for this purpose.

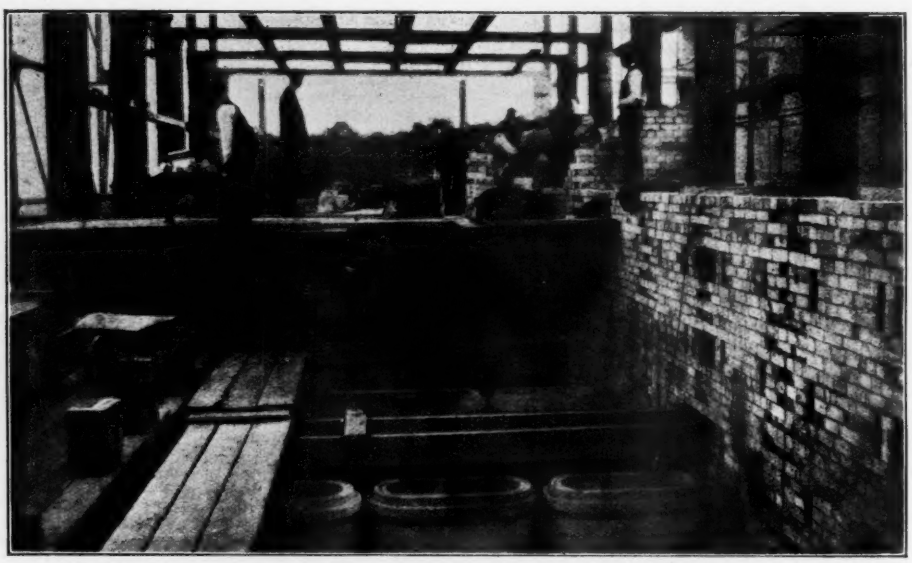
So much for the main structure; now as to the bench-fittings. Each retort is furnished with a cast-iron gas-outlet mouthpiece, provided with a ball inspection valve. The gas take-off pipe is fitted with a gas-valve for shutting-off the retort, and is connected to a light steel collecting main common to the whole of the eight retorts in each setting. This collecting main is provided with gas and tar outlets, with connections to a foul main, 24 inches diameter, which conducts the gas from the whole of the eight settings of retorts. At the end of the foul main, there is an 18-inch retort-house governor, with bye-pass valves and connections, tar seal-pot, and fittings.

The coal-feed hopper to each retort mouthpiece has a capacity for three hours' supply of coal. Fitted to the hopper is a patent rotary valve, with inlet of a suitable design for receiving the coal from the overhead coal-bunkers, which are constructed of steel plates, braced by angles and tees, and supported on steel I section stanchions and 24 inch by 7½ inch main girders, with channel bracings.

The Coal-Handling Plant.

We may make a little deviation here from the line of description to get down to the coal breaking and elevating plant. In the coal-store the coal is discharged through bottom-door truck waggons. At either end of the store is placed one of West's coal-breakers, fitted with mechanical feeding gear and screen. In conjunction with each of the two breakers, a steel chamber has been built with means of access from the retort-house; and sliding-doors have been fitted in this, so that the attendant can regulate the feed of the coal to the breakers. One of the chambers has been provided with a hopper of 60-tons capacity; so that coal coming from any colliery can be isolated, put direct through the breakers, and tested for its gas-making properties. This avoids, as is the usual practice for this purpose, the trimming of the coal space round the breakers. Here in these chambers, as in connection with all other vital parts, there is an abundance of space, so that the attendant has no difficulty in obtaining access to the machinery for the purposes of oiling and examination, and everything is amply guarded.

From the breakers, the coal is elevated by cased-in chain and bucket elevators, which supply the coal to a reversible push-plate conveyor extending the whole length of the bunkers above the retort-bench. The situation of the breakers and the conveyors enables coal to be removed from either end of the store, and, the conveyor being reversible, the continuous bunkers above the bench can be fed from either elevator. The plan of separate elevators and the conveyor reversibility are also partly a provision with a view to the possible extension of the retort-house. Each breaker and its line of elevator is driven by a 44-effective horse-power gas-engine, housed at the opposite ends of the retort-house. The working capacity of each elevator is 40 tons per hour, and the storage capacity of the overhead bunkers is thirty hours; so that a man working less than an eight-hour shift can get the whole of the coal elevated that is likely to be required for the ensuing twenty-four hours.



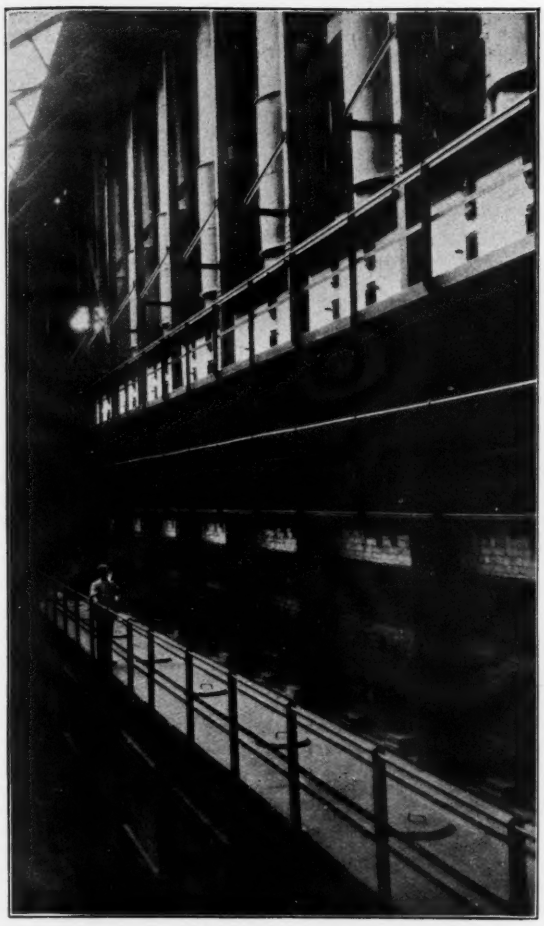
THE GLOVER-WEST VERTICAL-RETORT BENCH UNDER CONSTRUCTION.

Coke Extraction and Removal.

Passing to the equipment at the bottom of the retorts. Below each is a cast-iron coke-receiving chamber, capable of retaining the coke discharged from the retort by the coke-extractors during two hours. Each chamber is provided with a self-sealing mouthpiece lid and fastenings, arranged to supply the coke transporting waggons. The coke-receiving chambers are also provided with inspection holes and lids for attending to the retort during the process of scurfing.

The coke-extractors are of the Glover-West patented worm type, which can be divided for the purpose of disclosing an aperture through which the retort can be readily inspected. Each extractor is also provided with adjustable speed regulating gear, which enables the speed of the discharge of the coke to be promptly adjusted for each retort, and to suit the carbonization requirements of any particular class of coal. The whole of the extractor driving-gears are connected by steel-wire ropes with supporting pulleys to the main drive, which is provided with a main speed regulator, and is driven by a gas-engine of 10-effective horse-power. A duplicate engine has also been installed as a stand-by. These engines are housed at one corner of the retort-house.

For conveying the coke from the retort-house, there is a system of coke-waggons, which are hauled along rails placed in line with and below the retort-bench; the waggons being drawn out at either end beyond the house, where their loaded bodies are lifted from their under-frames by one of the telphers suspended from the elevated track [to be presently described] extending from both ends of the retort-house to the coke yard, and to the coke-storage hoppers. The coke-transporting plant also enables the telpher to lift the coke-waggon bodies, and discharge the coke from them to a hopper conveniently placed for filling the producer charging



The Producer Side of the Vertical-Retort Settings.

waggons which run along rails placed on the producer charging-stage, which is on the same side of the retort-bench as the coal-store. The telpher plant is also of sufficient height to enable the coke to be elevated to the top of the retort-bench, for raising the supply that is required for filling the retorts when they are being put into operation.

Weighing the Coke for the Producers.

A feature of interest is noticed during the inspection of the plant; and we wish, for the reliability of the data as to fuel consumption, that it was a feature of more general adoption in retort-houses—that is, the actual weighing of the coke fed into the producers. At the coke-hopper end of the producer-feeding floor is a self-recording weighing-machine by Pooley and Sons; and by this the filled feed-waggons are weighed. The registration is made on a ribbon; so that by this means an absolute record is effected of the quantity of coke used for fuel. There is the possibility that the man in charge of the feed-waggon will not always register the weight; but a check is kept on this by the fact that the machine also counts the loaded skips passing over it. Thus, if there is any difference between the number of weighings and the countings, it is a very easy matter to calculate the average difference. Take a recent example, in one week there were 420 weighings, but the counter indicated that 422 skips had passed over the machine, so that allowance had to be made for the two unweighed ones.

The Details of the Telpher Coke-Handling System.

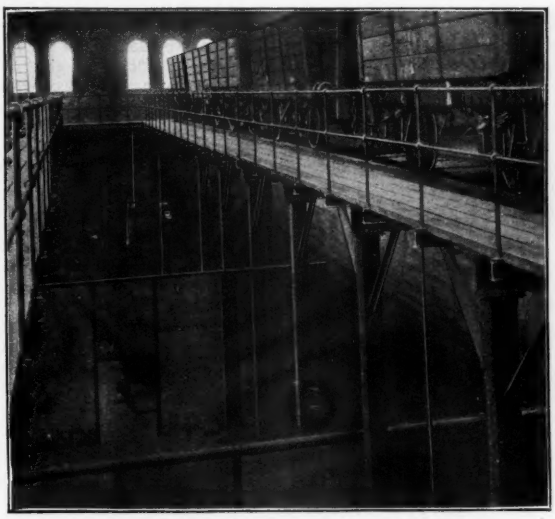
Already there has been incidental reference to the coke-handling plant, in order that the sequence of operations might be preserved in the description. But the incidental reference is inadequate in detail, for the telpher and system generally have about them several points of interest. The plant complete is the work of Messrs. Robert Dempster and Sons, Limited; and it incorporates their large experience in this type of structure. Let us first generally map-out the scheme. It has been explained that the coke is removed from beneath the retorts by means of coke-waggons; Mr. Tarratt's preference for this system being that it avoids the breakage of coke, and that there is not the same wear and tear as would be experienced with a coke-conveyor. For the haulage of these waggons an endless rope plant has been adopted, running right through the house below the floor-level. The waggons are hauled by an automatic grip arrangement to a position directly under the telpher track, which runs at right angles to the haulage gear. In this position the skips are picked up by a mono-rail electric telpher, which lifts them to a considerable height and conveys the coke either to the storage heap or into the screening-hoppers. The telphers are in duplicate; so that, when one is under repair, the other is available, or when large coke orders are received for shipment, there is one at disposal for continuous loading into railway trucks without interfering with the coke removal work of the other.

The Rope Haulage System.

Coming to details, and starting with the steel-wire rope running in the channel-troughs under the floor of the retort-house. The rope, which is always running, is driven by means of a Siemens electric-motor, through machine-cut spur-gear. The coke-skips are arranged with cone bottoms and saddles for resting on bogies, with flanged wheels for running on the narrow-gauge railway, which is continued from end to end of the house and for some distance outside. The bogies are provided with two rope-grip attachments, which run in the channel troughs; and these grips are operated by the retort-house men by a lever fitted with balance-weight. To engage the trucks on the moving rope is a simple matter. The operator has merely to throw the lever to the right or left hand in accordance with the direction he requires the bogie to travel. The skips, on being filled, are attached to the moving rope, and then traversed to a position directly under the telpher track, where the telpher operator lowers the lifting hooks, picks up the skip from the bogie, and conveys it direct to its destination.

Telpher Plant.

The telpher track is approximately 550 feet long, and is also provided with a switch arrangement in the storage yard, so that the telphers when travelling from the house can proceed to the right or left at right angles to the direction of travel from the house. The track to the left-hand side connects-up the telpher with the screening hoppers, and the right-hand side connects to the coke-storage ground or the railway siding. At the railway siding, the track projects over the railway lines, and is arranged for delivering coke direct into the railway waggons. By the manipulation of the switch, a diversity of operation can be secured. Coke can be taken direct to the storage hoppers, or to the storage ground, or to the railway waggons; or the coke from stock can be picked up from the storage ground, and conveyed to the hoppers or to the railway waggons, just as desired. As previously mentioned, the producer hopper on the retort-bench is also charged with coke by means of the telpher.



The Railway Gantries and Partitions in the Coal-Store.

The telpher track is constructed of 15-inch by 5-inch rolled steel joists, with special reinforcing channel attached to the top to ensure lateral stiffness. A renewable bulb rail is secured to the top of the channel by means of hook bolts, and on this track the telpher trolleys run. The track is suspended from the trestles by means of sling bolts; and in the coke-storage yard lattice girders are arranged to give very large spans over the stored coke, so that the trestles do not form an obstruction. Another advantage is that there are fewer trestles with their lower parts buried in the coke heap. From these lattice girders the track is suspended by steel channel and plate hangers. The curved portion of the track is also suspended from overhead joists by similar hangers; the joists being carried on the top of the telpher track trestles. The trestles themselves are constructed of steel channel uprights, in duplicate; the channels being joined together at the top by cross channels from which the track is suspended. The trestle legs are braced together with steel angle-ties, gusset plates, &c., and are provided with heavy steel foundation plates, by which they are secured to the concrete foundation blocks. The electric current is conveyed to the telpher by means of two 8 section trolley wires, which are clipped by gun-metal mechanical ears and insulators; the insulators being attached to the underside of the lattice girders and trestle cross joists.

Coke-Storage Plant.

The coke-storage hopper (which is divided into five compartments) is fitted on top with a screen, capable of dealing with 10 tons

of coke per hour. The approximate capacity of the hoppers is 60 tons of screened coke, 20 tons of medium coke, and 20 tons of breeze. Above the screen is a receiving hopper, into which the telpher skips are discharged; the hopper being provided with a slide-door, so that the flow of coke on to the jigging-screen can be regulated. The hoppers are coned at the bottom, and provided with outlet-doors, operated by chains and chain-wheels from the ground level—the arrangement being such that the coke can be delivered direct into carts. The screen is of the balanced propulsion type, worked by eccentric rods, and driven by a belt from a Siemens electric-motor. It is noticed that at either side of the screening conveyor platforms are arranged with hand-railing, and access to these platforms is by a staircase at the end of the hoppers, so that all the screen and gear is easily accessible. The hoppers are of steel plate, ¼ inch and $\frac{5}{16}$ inch thick, and are supported by rolled steel joists and stanchions.

The Electric Telphers.

The two electric telphers are of the Brooks and Dempster patent swivel-bogie design. As already pointed out, they can be worked simultaneously without interfering with one another. Each machine, we learn, is capable of hoisting a gross load of 40 cwt. at 70 feet per minute, and travelling at a speed of 500 feet per minute.

Coke-Skips.

The coke-skips by which the coke is removed from the retorts have a capacity of 15 cwt. each. They are provided with a trunnion at each end, to which the hooks of the lifting bale are attached; the trunnions being fixed in such a position that, when the tipping-catch is lifted by the operator, the skip automatically turns through one complete revolution—thereby discharging the load, and automatically righting itself. Each machine is provided with a lifting bale made of two horizontal channels, each 5 inches by 2½ inches. To the channels the ends of the hoisting-ropes are attached. At each end of the channels a round bar hook is fixed; the hook nearest the cabin being provided with the tipping-catch to which the tipping cord is attached.

Telpher Shelter-House.

The portion of the track over the siding is extended about 20 feet beyond the railway lines, and a shelter-house for the telphers is provided in this bay. It is built of a steel-angle framework secured to the trestle stanchions; the whole being covered with galvanized corrugated sheeting. Swing doors are provided for the telpher to enter. Glazed window frames are fixed at each side and end, and a substantial wood floor has been provided. The telphers can here be overhauled, and adjustments made, when necessary. It may be mentioned that, while the whole of the coke-handling plant was supplied by Messrs. Dempster and Sons, Messrs. Nortons (Tividale) Limited, of Tipton, Staffs., were the sub-contractors for the screens.

Condensing Plant.

Just outside the retort-house, on the side facing the coke-yard, two condensers (of 2 million cubic feet capacity) have been erected. They are of the vertical water-tube type, and were supplied by Messrs. R. & J. Dempster, Limited, of Manchester. The condensers are fitted with the firm's special valves, so that the flow of gas can be altered at will. There are two four-way valves; and with these the gas can be turned nine different ways. But, as at present arranged, by moving one valve, the flow is reversed from day to day, which is here found sufficient.

The Tar and Liquor Tank.

The new cast-iron tar and liquor tank (supplied by the Whessoe Foundry Company) is placed on a reinforced concrete foundation, about 12 inches thick. The internal flanges on the bottom have been filled-in with concrete so as to give a level surface. The tank is divided by a cast-iron partition for tar and liquor; and a cast-iron separator box has also been constructed inside, in which is one of Messrs. R. & J. Dempster's separators. The tank cover consists of expanded steel and concrete, on 12-inch by 6-inch girders, supported by the sides of the tank and 29 cast-iron columns. The diameter of the tank is 50 feet, and its depth 10 feet; the capacity being 125,000 gallons.

The Electric Plant.

Regarding the electric energy required for driving the telpher plant, the rope haulage gear, and the screens, it is taken from the electric generating set already installed for the De Brouwer plant in No. 1 retort-house. A 40-horse power gas-engine is used. It is direct-coupled to a Lancashire dynamo; and the supply is at 230 volts. As a stand-by, a Siemens motor generator (of 130 amperes) has been installed—taking current from the town mains at 460 volts.

A Uniform Quality of Gas.

While congratulating Mr. Tarratt and his Committee upon this bold stroke of policy to (while providing for the future) produce substantial economy in working, there is another point on which there may also be congratulation. This is the fact that, by the aid of the new plant, what may be described as standard production of coal gas has been achieved. The registrations by the "Sarco" recording calorimeter (which is daily verified by readings with a Junkers calorimeter) shows day by day an unvarying calorific line—550 B.Th.U. gross—and the "Metropolitan" No. 2 burner a 15-candle gas with infinitesimal variation. From hour to hour there is practical steadiness in the production; and it is with gas of this uniform quality that Darlington is now being supplied. The coal used is all Durham.

For the inspection of the plant, and assistance in collecting the information incorporated in this article (together with the photographs), we have to thank Mr. Tarratt, who, we may say, has been ably assisted by Mr. A. E. Ruffhead, Assoc.M.Inst.C.E., in preparing the necessary drawings and specifications, and supervising the works during construction.

LECTURE ON TOWN-GAS ENGINES.

The series of three lectures at the Westminster Technical Institute, Vincent Square, S.W., on the operation, erection, and selection of "Town-Gas Engines" was concluded by Mr. W. A. Tookey on Friday evening, before a very satisfied audience. On this occasion—the subject of the lecture being the basis for the selection of an engine—lantern-slides proved unnecessary; but the blackboard was frequently requisitioned to explain points, and furnish figures, which will doubless prove of practical value to those who were present when they are called upon to deal with the question of motive power.

The Selection of Gas-Engines.

In his opening remarks, Mr. Tookey said that the one great point to keep in mind is to get the right engine for the particular work to be done. That is to say, one must not have an engine that is too large, for then it would work always at the lowest end of the scale of its mechanical efficiency. Neither must it be too small, for then one would be asking it to work at full intensity for every possible impulse its mechanism would provide for. To understand the principles of gas-engine rating, it is necessary to realize the basis of what is termed "indicated horse power." The indicated horse power is a function of the cylinder dimensions of the gas-engine, the number of impulses per minute, and the mean pressure of each impulse. Quite recently, he went on, he was able, from noting in a particular manner the results obtained from testing a large number of gas-engines, to put forward a comparison between the mean pressure and the heat value per cubic foot of the mixture admitted; and this comparison agreed so closely with the performance of every style, design, make, and size of engine, that he put it before them that evening with a very great deal of confidence that it would give them a good idea of what mean pressure to expect if they put a certain amount of gas in the engine.

The mean pressure obtained in any engine, he said, varies, first, with the position of the gas-cock; secondly, with the instant of ignition; and, arising from both these variables, with the regularity or otherwise of one impulse compared with another. They would have noted from the diagrams already shown that a very great difference occurs in the mean pressures when the ignition is not properly timed; and he had dealt with the methods by which these things can be adjusted so that an engine will give its correct duty. The indicated horse power of an engine is not of a constant value; it varies with the load. It is the power which the gas-engine constructor must make the most of for rating purposes; each impulse being considered by itself, and being properly timed, so that there is no waste from irregular working in any way. And this "maximum" horse power can only be secured when these matters of adjustment are attended to, and when the maximum number of impulses according to the revolutions are obtained. But before we can take power from an engine, a certain amount is absorbed by friction. When this loss is subtracted from the indicated horse power, the remainder is what is called brake horse power, which is the power available for transmission. The frictional horse power is a wonderfully constant quality, being calculable from the engine cylinder dimensions and speed, and at full load is about 15 per cent. of the maximum indicated horse power. In other words, the maximum brake horse power available is about 85 per cent. of the maximum indicated horse power. Brake horse power varies with the indicated horse power, with the number of impulses, with the strength of the mixture, and with the regularity or otherwise of operation.

Maximum and Working Power.

Setting himself to answer the question of what is the difference between the maximum horse power and the working horse power of an engine, the lecturer said that makers generally give the maximum horse power, but users know that they dare not work an engine up to this. The allowance to be made for the working load depends entirely upon the work to be done. If the engine is working a lot of machines each taking only a little power, and these machines run on and off (like sewing-machines), one machine sandwiches in with the others. There is thus a steady load, and one can afford to allow a rather smaller margin than would otherwise be the case between maximum and working power. The usual allowance for engines that are doing uniformly heavy work for long periods is something like 25 per cent., for engines working under ordinary workshop conditions about 15 per cent., and for lighter work, where the engine may be driving tools (as a saw-bench) which require power more or less intermittently, 10 per

cent. In arriving at the margin of power to be allowed off the maximum, what one has to consider is not the number of impulses so much as the intensity of impulses. If an engine is always working at its top load, there is bound to be trouble sooner or later. With town gas, the limit of capacity of an engine is about 95 lbs. mean pressure per square inch of piston area. This is what the makers generally rate their engines at. For constant heavy load conditions it is never advisable to let the mean pressure exceed 90 lbs. per square inch, or (say) from 85 to 88 lbs. for the heaviest work.

Economy.

Economy, continued Mr. Tookey, is a very important point. Commercial considerations are becoming of more and more importance every day in connection with gas-engines. There are certain figures usually given for consumption of gas in engines; but these are obtained in a very rough-and-ready manner, and so far as he knows they are not given in any text-book with proper qualifications. As most of them were doubtless aware, the scientific work done in connection with the gas-engine during the last ten or fifteen years has proved that according to the increase in compression pressure under which an engine works so is the economy of the engine improved.

In relation to gas-engine economy, one speaks of thermal efficiency. Now, the thermal efficiency of an engine is merely an expression which will give the ratio between the amount of work the engine does and the amount of heat put in to get this work out of it. In a British thermal unit there are 778 foot-pounds of work; and for one horse power there are 33,000 foot-pounds needed. Thus 42·41 thermal units are needed for a horse-power. This, however, is per minute; and multiplying by 60, the figure of 2545 is arrived at as the number of British thermal units needed to give one horse-power-hour. Assume an engine takes 20 cubic feet per hour of gas of 500 B.Th.U., this gives a total of 10,000 B.Th.U. of heat supplied. This divided into 2545 (the amount of heat converted into work) gives a result of 0·2545; and so it can be said that an engine taking 20 cubic feet of 500 B.Th.U. gas per horse-power-hour represents a thermal efficiency of 25 per cent.

Thermal efficiency can be stated in terms of indicated horse power or brake horse power, it does not matter which, so long as the proper qualification is mentioned. If the figure of 25 per cent. is on the brake horse power developed at full load, and assuming 85 per cent. of the indicated horse power, the thermal efficiency per indicated horse power is about 30 per cent. As before stated, the thermal efficiency of a gas-engine per indicated horse power varies with the compression pressure. On an engine having 48 lbs. compression pressure, the practical thermal efficiency to be expected with so low a compression as this is 20 per cent. Therefore, instead of 10,000 B.Th.U., there will be needed 12,700 B.Th.U. per indicated-horse-power-hour. Dividing this figure by the calorific value per cubic foot of gas—say, 500—one can arrive at the cubic feet of gas per indicated-horse-power-hour equivalent to 20 per cent. thermal efficiency, which would be 25·4. As to the efficiency on the brake horse power, the mechanical efficiency, if the engine was being worked to its fullest output, would be 85 per cent.; and, therefore, the consumption would be equal to 30 cubic feet per brake-horse-power-hour. At 80 per cent. mechanical efficiency, coincident with 80 per cent. of active charges, it would be equal to 32 feet; and at 73 per cent. mechanical efficiency (60 per cent. of "fires"), to 35 cubic feet per brake-horse-power-hour transmitted. This variation of gas consumption due to normal working loads must be borne in mind when making statements to customers with regard to the consumption in any engine. These, of course, are very high figures; but they refer to low compression engines only. At 75 lbs. compression pressure, the "indicated" thermal efficiency would be 27. Instead of 12,700, the figure is 9400 B.Th.U. per indicated-horse-power-hour; and the consumption of 500 B.Th.U. gas is 18·8 cubic feet per indicated horse power, and 22·1 cubic feet per maximum brake horse power. Coming to more recent practice, at 105 lbs. compression pressure the indicated thermal efficiency is 32, the B.Th.U. 8000, and the gas consumption 16 cubic feet per indicated horse power or 18·8 feet per maximum brake horse power, and 22 cubic feet at a lower load when taking only 60 per cent. of the maximum number of impulses. Some engines are working to-day with compression pressures that approach 140 lbs. At this pressure, the indicated thermal efficiency is 35 per cent., the B.Th.U. required 7260, and the gas consumptions 14·4, 17, and 19·75 cubic feet respectively, for indicated and brake horse power (the latter as before being at full output), and at 60 per cent. of impulses.

The point really to be driven home is: Do not accept any text-book information which gives one figure, and one figure only, for the gas consumption per brake horse power of an engine. There are variations due to circumstances over which no engineer has any control whatever; and the figures just stated are much safer guides.

Competition.

Coming to the concluding portion of his lecture, Mr. Tookey said that everyone is up-against competition, and especially competition with electric motors. It is well, therefore, to have some figures which will enable one to know what can be done with a gas-engine as compared with an electric motor supplied with electricity at so much per unit. Taking a gas-engine working, not at the best figure, but at 60 per cent. of impulses, it gives, as has been shown, a performance which is equal to 35 down to 19·75 cubic feet per brake-horse-power-hour, according to compression. One horse power is the equivalent of 746 watts, or 0·746 kilowatt. Before the motor can give out a horse power, it takes toll itself to some extent, because it has to keep itself in motion and maintain its speed. Therefore it has a mechanical efficiency, which varies to some degree according to the size and condition of the motor; but it does not vary any more than in the case of a gas-engine. At its best, its efficiency is as high as 90 per cent., against the 85 per cent. of the gas-engine. Again, as the load falls, so the motor efficiency falls, exactly as with the gas-engine, but not in so great a degree. Roughly, it can be taken that the efficiency of the motor in practical working is something in the order of 87 per cent. Now, this means that instead of 0·746 kilowatt, it is necessary to use 0·860 kilowatt.

Taking gas at 27d. per 1000 cubic feet, this is equal to 0·027d. per cubic foot, and reckoning 35 cubic feet per brake-horse-power-hour, it is found that the equivalent cost of current would be 0·95d. per 0·860 unit at the motor terminals. This proves that, even with the old-style uneconomical engine, the motor would have to be supplied with current at about 1d. per unit before it could compete with gas at 2s. 3d. per 1000 cubic feet. When there is in question an engine at 75 lbs. pressure, which needs 26 cubic feet of gas at a load requiring 60 per cent. of impulses, the equivalent would be 0·7d. per 0·860 unit (or 0·815d. per unit). At 105 lbs. compression, the gas-engine will give power at such a rate that it would require electricity at 0·7d. per unit; while at 140 lbs. compression, the cost of current to compete would have to come down to 0·65d. per unit. In all these comparisons, the average output of the engine is taken, not at the most economical figures to be obtained at full load, but at what is the average load of the majority of engines.

Answers to Questions.

After the lecture, a number of questions were put to Mr. Tookey, who, in the course of his replies, said gas-engine makers frequently based their calculations on a calorific value which was greater than was met with when an engine was worked on town mains. The 500 B.Th.U. of which he had spoken was the net value. With an engine working at 105 lbs. compression pressure, the initial explosion pressure would not exceed 340 lbs.; and with 75 lbs. compression pressure, the explosion pressure would be somewhere about 270 lbs. At a still lower compression pressure, they might get down to 180 lbs. explosion pressure. This, of course, was merely a matter of interest, so long as the cylinder was made sufficiently strong. It was the mean pressure they wanted. With regard to the position of the meter, it was better to have it close to the engine, with the service-pipe as short as possible. A 20-light meter would be sufficient for a 6-H.P. engine. But, of course, a 30-light meter would cost very little more; and it would be well to be on the safe side. With larger meters, however, the difference in cost became considerable, and had to be taken into account. With (say) a 50-H.P. engine, town gas would compete with suction gas, unless the engine was running day and night, and at full load all the time.

A Vote of Thanks.

Mr. J. Hewett (the President of the London and Southern District Junior Gas Association, by whom, in conjunction with the London County Council, the lectures had been arranged) proposed a hearty vote of thanks to Mr. Tookey; remarking that the subject of the gas-engine was a very fascinating one, and Mr. Tookey had long been an expert upon it. The success of the lectures had been highly gratifying; and they hoped on some future occasion they might receive further instruction from the same gentleman.

Mr. S. B. Chandler, in complimentary terms, seconded the proposition, which was carried with applause.

Mr. Tookey, in acknowledgment, said that if at any future time they asked him to give them some further information about gas-engines in the form of a lecture, he would be very pleased indeed to do so.

Application of Producer Gas to Brass Foundries.—This subject is dealt with by Mr. E. F. Bulmahn in the "Transactions of the American Institute of Metals" [Vol. VII., p. 288]. The use of producer gas for melting brass, for drying cores, and for power purposes in the brass foundry is advocated by the author. It is essential that the gas should be free from tar. At the Langsenkamp-Wheeler Brass Works, Indiana, an installation of four Westinghouse double-zone suction producers, each having a capacity of 500 lbs. of coal per hour, has been in operation for four years with satisfactory results. In the double-zone producer the raw fuel (bituminous coal) is carbonized in the upper section, and the residual incandescent coke converted into gas in the lower section. The gas is drawn off between the two sections, and serves to generate steam in a vaporizer arranged round the top of the lower section. It is free from tar, and is ready for use after passing through a wet coke and a dry scrubber. The gas has a calorific value of 110 to 115 B.Th.U. per cubic foot; and in order to obtain the required temperature in the furnace (2500° to 2600) Fahr., or 1370° to 1430° C.), both the gas and air are preheated by the waste gases from the furnace. Curves are given showing the relative cost of producer gas compared with ordinary lighting gas and with oil fuel. In melting red brass with producer gas, the loss of metal was reduced to 0·75 to 1 per cent.

COAL AND COKE HANDLING MACHINERY AT THE NEW SOUTH AMSTERDAM GAS-WORKS.

In our issue of Nov. 10 we briefly noticed a very interesting handbook, on coal and coke conveying plant, received from Messrs. S. Cutler and Sons, Limited, of Millwall and Westminster, who, recognizing the importance of such plant in the economy of modern gas engineering, have made it a speciality, and added yet another department to their comprehensive activities in gas and general engineering.

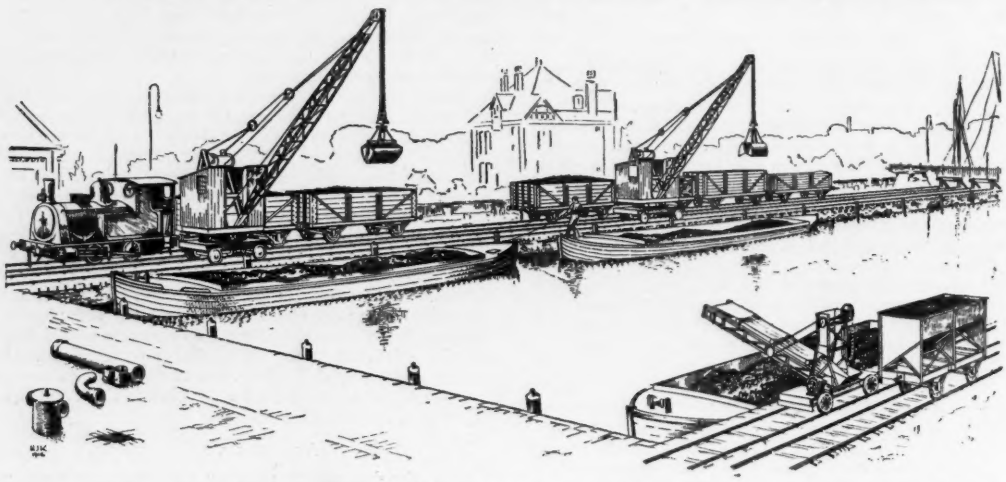


FIG. 1.—FROM A PEN-AND-INK SKETCH OF THE DOCK AT THE NEW SOUTH AMSTERDAM GAS-WORKS.

The installations described in the publication are numerous and important, and include the whole of the coal and coke handling arrangements of the new South Works of the Amsterdam Municipality, which, as many of our readers will be aware, are a very fine example of modern gas engineering. We have from time to time referred to the progress of this important undertaking, and hope before very long to publish a full description of all the plant. Meanwhile, the following particulars of the coal and coke handling machinery supplied by Messrs. Cutler will be of interest to the many engineers who find labour-saving machinery an increasing necessity. It will be seen that at Amsterdam hand labour is practically eliminated from every operation between the reception of the coal upon the works and the despatch of the coke therefrom.

We understand that Messrs. Cutler were invited as a representative British firm to submit designs in competition with several of the principal Continental firms specializing in such plant; and we are glad to be able to congratulate them on the fact that, after careful consideration on all points, the contract was awarded to the British firm, and has been successfully carried out.

The scheme contains many original features, and is on strikingly effective lines, as is indeed the whole of this important gas-works, which reflects the greatest credit upon the Chief Director of the Gas Department, Heer J. Van Rossum du Chattel, and the Assistant Director, Heer C. K. Visser, under whose auspices they have been carried out.

It is significant that, as noticed in our issue of Oct. 27, the Gas Department at Amsterdam contributed for the year 1913 no less than £150,000 out of profits to the Municipal treasury.

The accompanying plans and photographs are mainly reproduced from Messrs. Cutler's brochure, which contains a wealth of illustration not only in regard to Amsterdam, but also of numerous plants they have erected in England, Italy, Brazil, &c.—a feature which should make it a valued addition to the technical library of gas engineers and others interested in such machinery.

As many of our readers will be aware, the Amsterdam Municipality acquired the gas undertaking from the Imperial Continental Gas Association in 1886; the production of gas being at that time about 1000 million cubic feet per annum, whereas at the present time more than 3500 million cubic feet are produced, and the consumption is still rapidly increasing. To provide for this great increase of output, it has been necessary to considerably

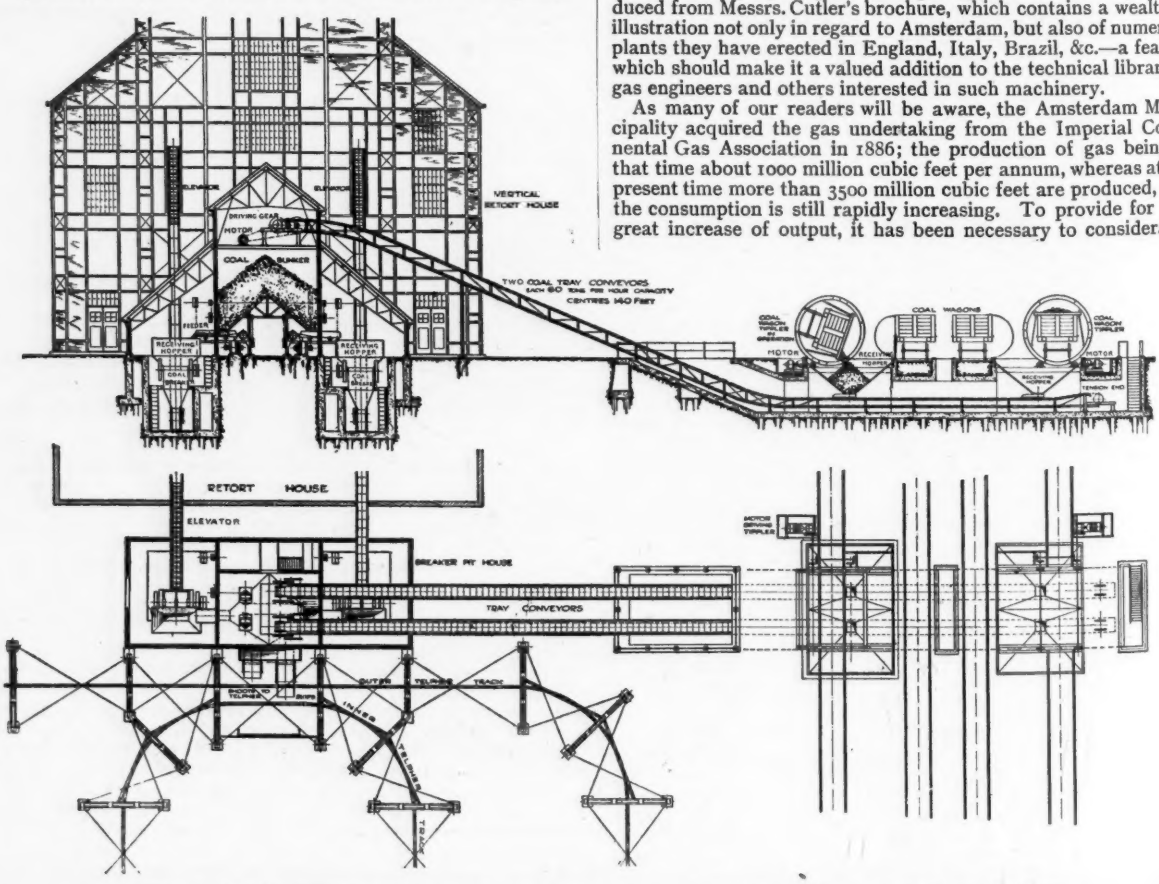


FIG. 2.—ARRANGEMENT FOR DELIVERING COAL TO THE RETORT-HOUSE OR STORAGE GROUND.

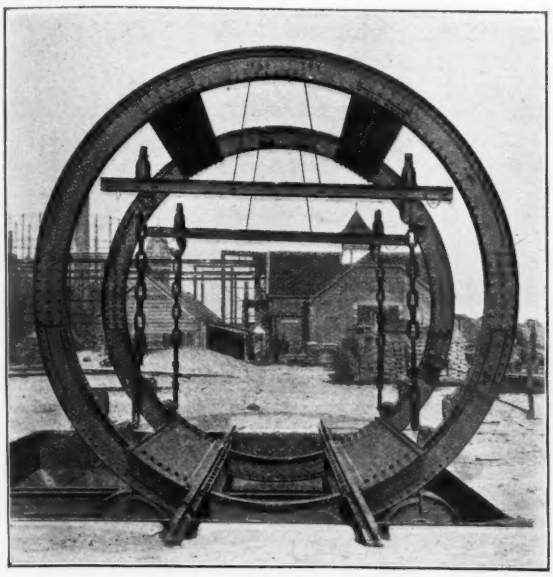


Fig. 3.—The Coal-Truck Tippler.

augment not only the plant at the existing Eastern and Western stations, but to put down two entirely new works, known as the Southern (or Zuider) and the Northern (or Noord). It is to the former of these works that this article refers. The works are at present equipped for the production of about 6 million cubic feet of gas per diem, with accommodation for large extensions. The bulk of coal and residuals to be handled is, therefore, very considerable, and an important factor in the economy of the works. The plant is, wherever possible, in duplicate; and each set is capable of serving the retort-house with 500 tons of coal per diem, and dealing with the receiving, the screening, and the loading of the equivalent quantity of residual coke.

It was made a condition of the scheme that no transporting of coal or coke should be necessary on Saturday afternoon or on Sunday. To this end, 48-hour coal-bunkers are provided above the retort-benches, and a 1000-ton capacity coke-bunker receives the quenched coke from the hot-coke conveyor.

A storage area for 50,000 tons of coal is provided at one end of the retort-house, and a suitable area for coke-storage at the other. Each area is traversed by electric telphers, which mechanically convey these materials into and out of store, as required, by means of overhead tracks, aggregating more than 4000 feet in length.

The gas-works adjoin the River Amstel, and have an exclusive dock of suitable dimensions to berth the coal and coke boats used for the transport of these materials. At the opposite end of the works there is connection with the State Railways; so that both water and rail transport are equally available, and arrangements are made for receiving and despatching either way with equal facility—thus reducing the risk of interruption in case of frozen waters or railway delays.

Fig. 1 shows the dock, with rail tracks on each side; one quay being reserved for coal and the other for coke. The coal is unloaded by means of two travelling electric cranes, each of 40 tons per hour capacity and 30 feet jib radius, operating grabs of one ton capacity, which discharge into waggons upon an adjoining track, whence they are hauled by the works locomotives to the rotary tipplers. These rotary tipplers are two in number, interposed in the rail-tracks as shown by fig. 2, and constructed and operated as illustrated by figs. 3 and 4.

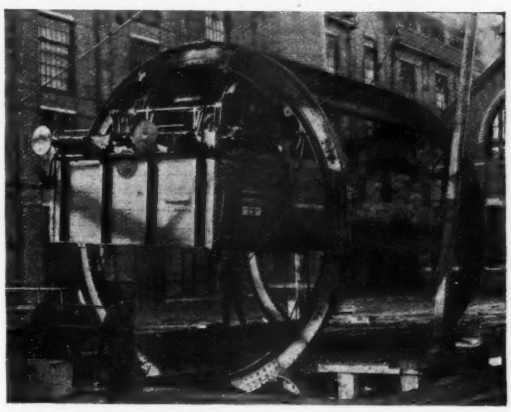


Fig. 4.—The Coal-Truck Tippler in Operation.

The tipplers are larger than is usual in English practice; being capable of discharging Continental trucks of 20 tons capacity, the weight of which, including tare, is about 30 tons. They are arranged in transverse line with the coal breakers, and are equally available for either water-borne or rail-borne coal. There are four rail-tracks; two outer ones serving the tipplers, and two inner ones from which trucks can be discharged by hand into the tippler hoppers if at any time necessary.

Beneath each tippler is a steel hopper covered with a grillage to intercept any abnormally large lumps of coal, and at the bottom is an outlet door to regulate the feed to the tray conveyors.

The two steel-plate tray conveyors are each of 60 tons per hour capacity, and pass from under the tipplers to the ground level in

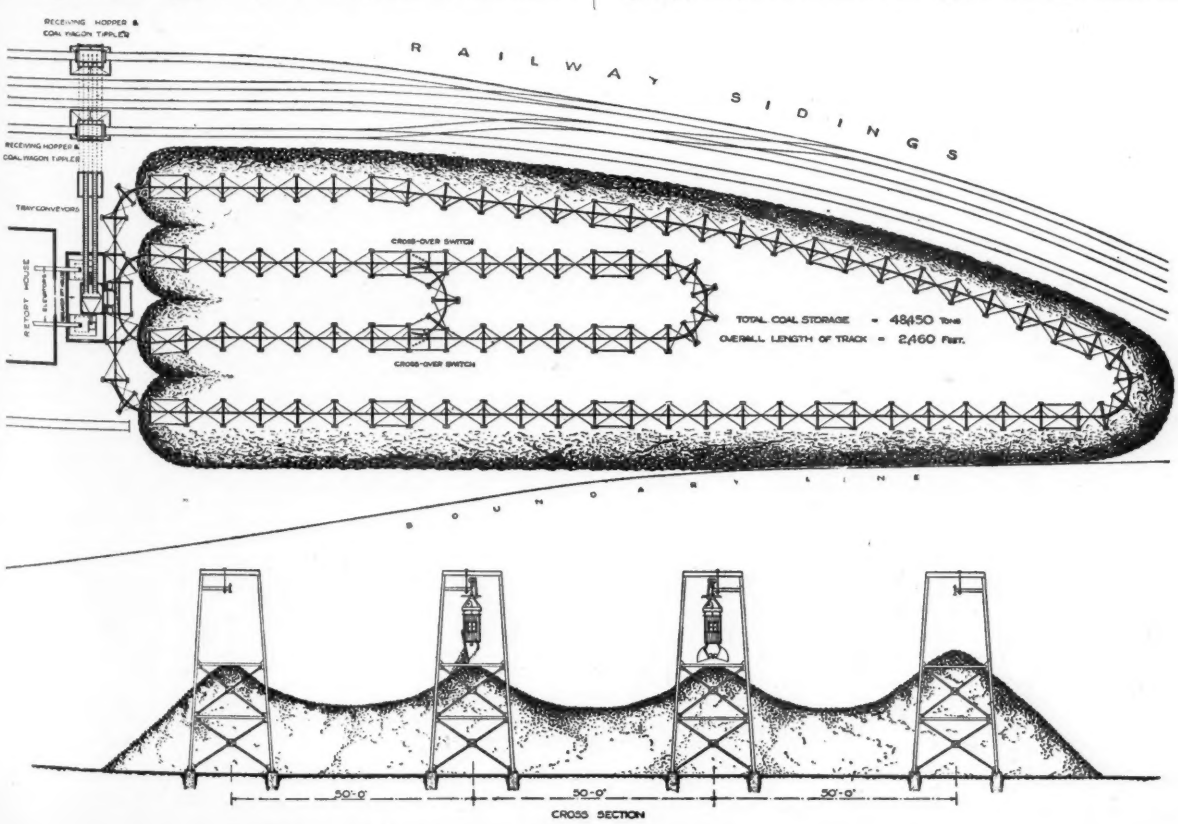


FIG. 5.—PLAN AND CROSS SECTION OF THE COAL STORAGE AREA.

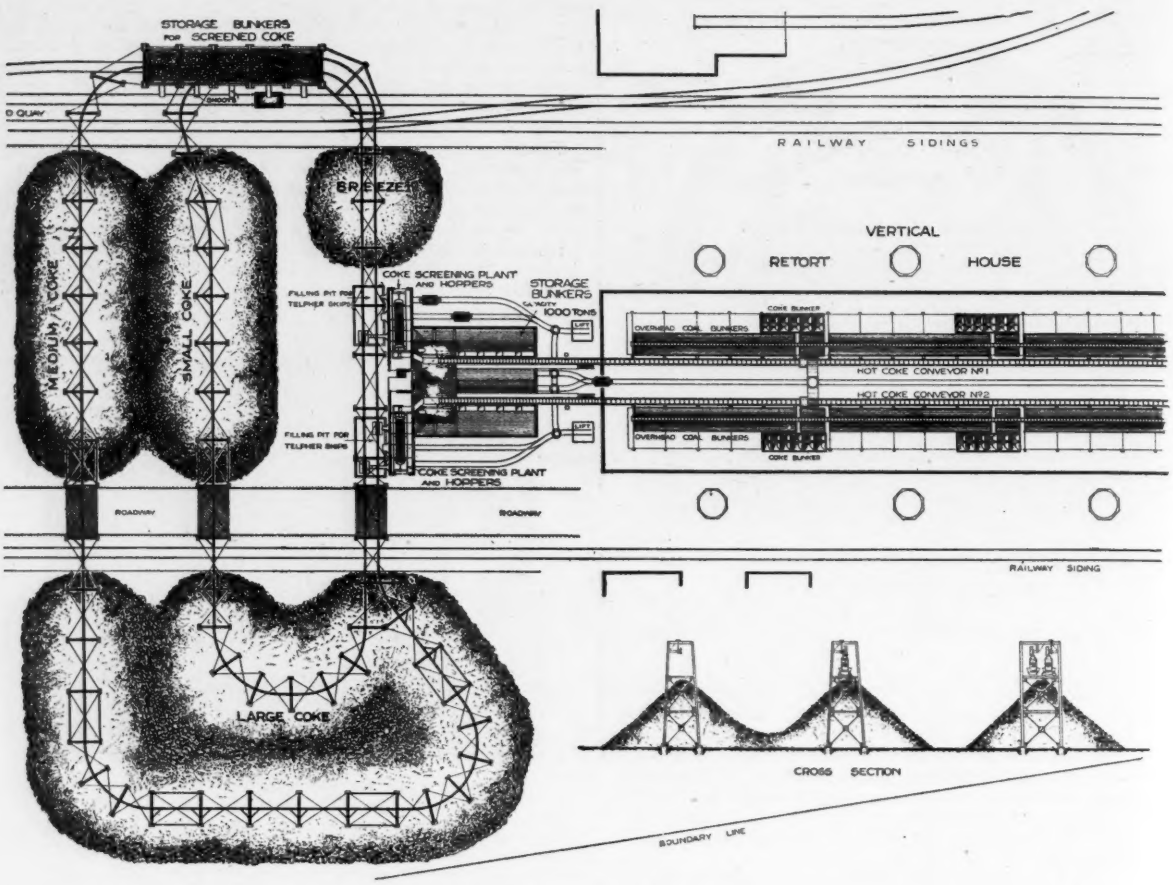


FIG. 6.—THE COKE STORAGE GROUND.

a tunnel; rising thence, as shown in fig. 2, to a receiving bunker, from which the coal is gravitated to the breakers or transported by the telphers to the storage ground.

After passing through the breakers—which are of the jaw type, and in duplicate—the crushed coal is raised by bucket elevators and delivered by push-plate conveyors into the hoppers over the retort-bench.

The transfer of coal from the storage ground to the hopper over the breakers is accomplished by means of telphers, which are fitted with self-loading and automatic discharging grabs.

In a gas-works of such large area, where the quay for water-borne materials is over half-a-mile from the point where rail-borne materials are received (or despatched), it is obvious the machinery for transporting materials is an important consideration; and a very extensive system of electric telphers has been installed by Messrs. Cutler. This is shown in figs. 5 and 6.

The aggregate length of the track approaches a mile, and six transporters are in constant use—the whole forming one of the largest and most comprehensive systems of telpherage installed in any gas-works. The track is 40 feet above ground level, and is formed of rolled steel joists with rail on the top flange. The trestles are of unusually substantial construction; the legs being

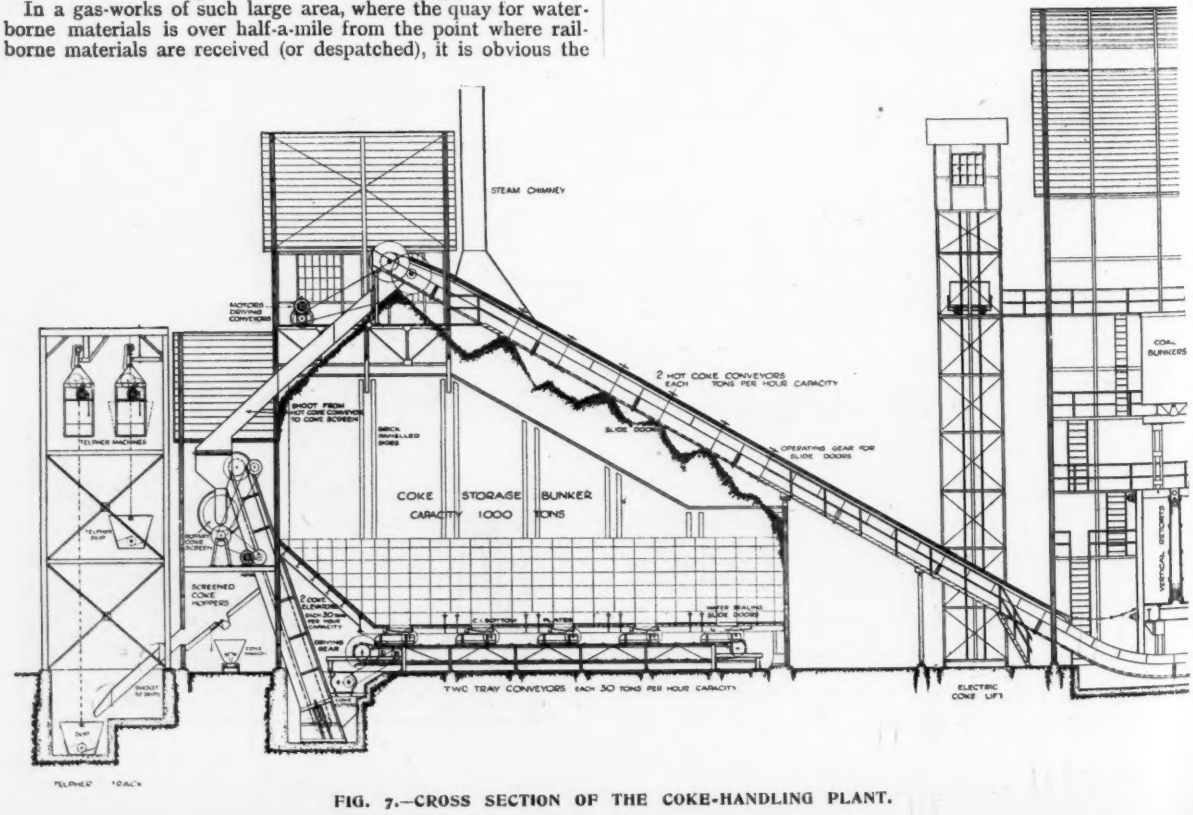

STEAM CHIMNEY
2 HOT COKE CONVEYORS EACH TONS PER HOUR CAPACITY
COAL BUNKERS
COKE STORAGE BUNKER
CAPACITY 1000 TONS
TWO TRAY CONVEYORS EACH 30 TONS PER HOUR CAPACITY
ELECTRIC COKE LIFT
VERTICAL RETORTS

FIG. 7.—CROSS SECTION OF THE COKE-HANDLING PLANT.

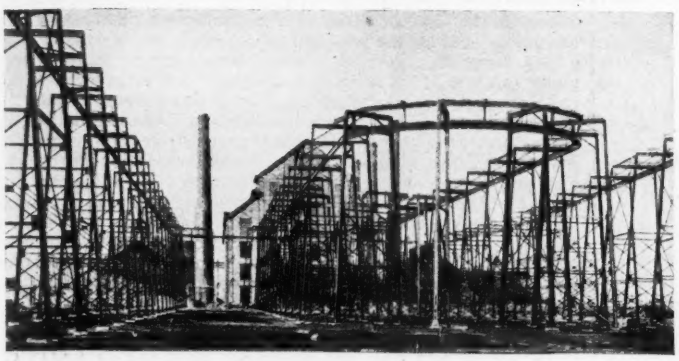


Fig. 8.—End View of the Coal Telpher Track.

of box section, strutted with double channels and braced with diagonals of double angle section. To increase the lateral stability of the track, certain pairs of the trestles are braced to form towers, as shown in the illustrations; the tops of the trestles being counterbraced with a series of wire cables fitted with adjusting screws and turnbuckles. Especial care has been exercised in the arrangement of the curves and switches, so that the transporters can readily negotiate them. The electrical equipment is of the most complete and up-to-date character.

The transporters are six in number—three for coal and three for coke—and are rated for a travelling speed of 500 feet per minute and a hoisting speed of 80 feet per minute. They have complete cabins to afford full weather protection to the operator.

The coal transporters are arranged for handling skips of 30 cwt. capacity or grabs of 20 cwt. capacity, and have a special interchange gear, by which the change-over can be quickly effected. Those on the coke section are arranged for skips only.

The coal skips are used for transporting coal from the bunker at the head of the tray conveyors to the storage ground—being filled by gravitation through a shoot provided upon the bunker for this purpose. The grabs are used for removing coal from the storage ground and discharging it into the bunker from which it was originally withdrawn. The supply to the retort-house can thus be either wholly or partially from direct supplies or from stock to suit the varying conditions of coal deliveries.

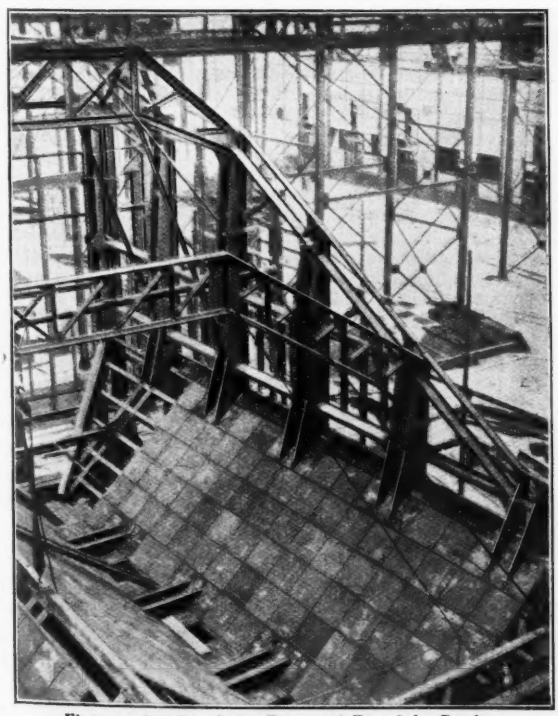


Fig. 10.—Details of the Thousand-Ton Coke-Bunker.

Electric current is supplied from the gas-works generating station (440 volts, direct current); and the motors are 25 H.P. lifting and 9 H.P. travelling for the coal transporters, and 16 H.P. and 6 H.P. for the coke-machines.

The middle coal track has a cross-over switch to shorten the circuit over the coal heap immediately adjacent to the retort-house; this being the most used portion of the stock ground.

The coke plant is of the most complete character; the whole of the operations between the retort-house and the loading for sale being mechanically performed.

The retort-house, as will be seen from figs. 6 and 7, is served by two hot-coke conveyers, which rise at the end of the building and discharge into the bunker of 1000 tons capacity. This bunker is supported overground upon steel stanchions, so as to allow the coke to be withdrawn from beneath. It is a structure of considerable engineering interest—65 feet by 55 feet on plan, and 36 feet high. The bottom is of hopper shape to facilitate discharge, and the sides and ends are framed with heavy plate steel cantilevers so as to avoid all necessity for internal bracings. Above the bunker, and supported from it, is a commodious machinery room containing the electric motors and gears actuating the inclined coke conveyors by which the bunker is filled. Figs. 10 and 11 show the design of the bunker, the bottom of which

Fig. 9.—Side View of the Coal Telpher Track.

is formed of cast-iron plates carried on heavy steel bearers, and the sides are panelled with Dutch bricks, cement rendered inside. The side walls are continued down to the ground level to enclose the coke conveyors below; thus the exterior of the structure has the appearance of an elaborate brick panelled building (see fig. 11).

The machinery room above the bunker is roofed with Dutch tiles, and all details are in conformity with the adjacent buildings. Another point of interest is that the whole structure is carried on timber piles, which must in no case be loaded beyond a certain stipulated figure, and the substructure had to be very specially designed to conform with this condition.

The bottom of the large coke-bunker is provided with a series of outlet doors, which are water-sealed to prevent the admission of air, which might tend to kindle any inadequately quenched coke. Beneath these doors are arranged conveyors, which transport the coke, to the elevators, and deliver it to the coke screens, which sort it into the following sizes: Large, 2-inch cubes, 1½-inch cubes, ¾-inch cubes, and breeze.

A receiving hopper is provided for each size, and fitted with a suitable shoot for delivering the contents into telpher skips, by means of which it is transported to the "sorted-coke bunker"—a large elevated bunker placed alongside the railway sidings and fitted with all accessories for loading by gravitation, either into railway trucks or into bagging shoots for local sale.

As a large quantity of coke is despatched by barge, special arrangements have been made by means of which it is loaded in an unusually economical manner. A siding is laid off the railway track to the "sorted-coke bunker," under which it extends and so permits a special hopper truck of large capacity to be brought beneath the bunker, as shown in fig. 12. This is filled by gravita-

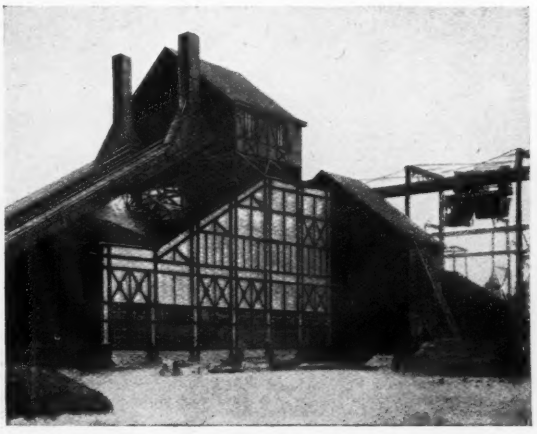


Fig. 11.—The Exterior of the Coke-Bunker.

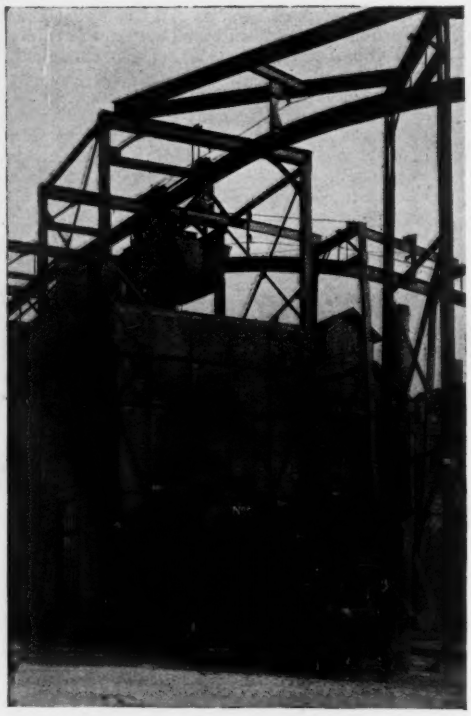


Fig. 12.—The Sorted Coke Storage Bunker.

tion and then hauled by a works locomotive to the quay, where its contents are discharged into the barge over an adjustable loading shoot, as shown by fig. 1; the whole operation being of the simplest character.

In addition to these arrangements for the disposal of the main supplies, there are a number of auxiliary shoots, &c., to provide for the withdrawal at suitable points of coke and breeze required for works purposes, also means of bye-passing any of the machinery when so desired.

The coke telpher is on similar lines to the coal telpher, and is used for transporting unbroken coke from the main bunker to the storage ground or loading it into waggons, also for conveying the several grades of coke from the screen hoppers to the "sorted-coke bunker."

All the machinery is electrically driven by motors using three

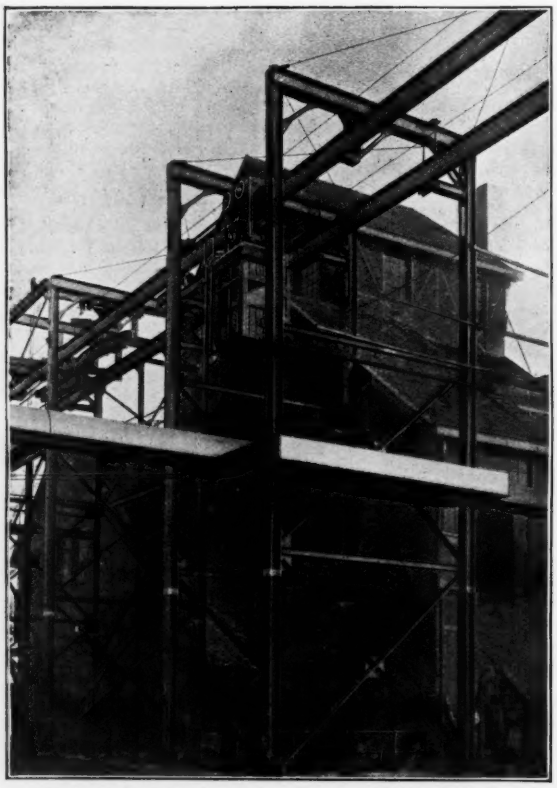


Fig. 13.—The Telpher and Machinery Rooms for the Coke-Handling Plant.

phase alternating current for the stationary machinery and continuous current for the telphers.

The foregoing description deals exclusively with the overground portion of the work at Amsterdam; but as the whole of the buildings and machinery are on piled foundations, it is obvious that the preparation of these has been an expensive matter, as well as one requiring considerable engineering skill on the part of the Works Directorate who carried out this portion of the scheme. The preparation of the site was in hand for several years, and many thousands of tons of sand were used to consolidate the soil before the piling was commenced. The conveyor tunnels and many other parts of the underground work are constructed in reinforced concrete; and we hope, when publishing a further account of this important gas-works, to include some of these interesting details.

ELECTRICITY SUPPLY MEMORANDA.

THE "Point-Fives" have held another meeting, and have been telling each other that things are much as they were regarding domestic electric cooking and kindred matters. It is a tale that they think well worth repeating in each other's ears year after year. Perhaps in time they will get a bit tired of it, unless they are blessed with patience to a degree beyond most other mortals. At the meeting, Mr. W. G. Pickvance, of Wrexham, presided; and he did not seem at all disposed to screen the fact that for him, other conditions being inimical, there was a great deal of bogey in being a "Point-Five." To cultivate the domestic load, especially the cooking load, the 0·5d. per unit requires to be accompanied by wiring powers, cheap electric cookers, and low hiring rates. The fact of the matter is that Parliament had better withhold its hand from granting such powers; as it is clear there are electrical libertines who would make the 0·5d. break down under the enormous load that it would have to bear. Yet Mr. Fedden, of Sheffield fame, talks of domestic purposes being—when and where he does not specify—supplied hereafter at ¼d. per unit. If Mr. Fedden will carefully read Sir John Snell's address to the Institution of Electrical Engineers, he will see that Sir John indirectly tells him not to be so silly. Then as to the electric-cooker. Mr. Pickvance asks, "Has the small central station engineer a cheap and reliable cooker at his command?" This is the Chairman's own answer: "That he has no *economical* cooker we know; while its reliability has improved, *it is not yet perfect;* and its cost, service for service, against the gas-cooker, is such as to put it entirely out of court. Electrical cooking as applied at present might very reasonably be termed a luxury, since only comparatively well-to-do people have the opportunity to entertain it." That was plain and frank speaking, which was not endorsed by all the "Point-Fives" present. But Mr. A. H. Seabrook did admit that he still had to make inspection of the cookers in Marylebone once a month, instead of as formerly once a fortnight, and then the bulk of the inspectors' duty consisted of cleaning the cookers. Surely not! The cleanliness and purity of the electric-cooker has been an argument in its favour. But it seems from Mr. Seabrook's confession that an expert is required to keep the cookers clean; so that apparently it is a task beyond the capacity of the ordinary user. Of course, the idea that the electric-cooker has not universal applicability was pooh-poohed by some of those who heard Mr. Pickvance; and Mr. J. W. Hame who hails from York stated that he has put complete electrical equipment into 32 new houses of a rental value of only 6s. 8d. per week. Having set this up for admiration, some one proceeded to knock it down by making it known that these houses are Corporation property, which tells a tale. Mr. Pickvance unkindly described gas companies as "enemies" and dragged in "vicious" in referring to their line of action. It is not quite clear what he was alluding to; but Long Eaton may not be blameless.

Still Grumbling.

It's a Long Way——

The wiring and hiring powers that Mr. Pickvance and others so dearly want seem a long way beyond their reach. The Bill for which the Incorporated Municipal Electrical Association took lodgings at Westminster some years ago, and which is only taken out by a friendly hand for an annual airing, does not appear to generally commend itself; and very few members of Parliament have disclosed a willingness to assist in the realization of the aspirations of the corporate promoters. Mr. H. Faraday Proctor confessed as much at the last annual meeting of the Association [see "JOURNAL," July 7 last, p. 18]. On that occasion, however, he suggested that those local authorities who actually desired the powers should promote a Joint Private Bill, in order to obtain them—much the same as the gas companies had done in connection with the Sulphur Compounds Restrictions and the "Metropolitan" No. 2 standard test-burner. The idea then received the blessing of the Honorary Solicitor to the Association. "Electrical Industries" now reports that there has been a development of the proposal, and that those interested are approaching various local authorities in search of the necessary financial support. We shall know the result shortly, if such a Private Bill is going to be promoted in the current session of Parliament, seeing that there will have to be publication of the notices within the next few days.

The difference between the proposed Joint Bill and those promoted by certain gas undertakings is that the latter dealt with principles already approved by a Departmental Committee and endorsed by Parliament. If the suggested Joint Bill by municipal electricity undertakings is on the lines of the general measure that has been resting for so many years at Westminster, certain of the powers—at any rate, the financial ones—will be looked at rather unfavourably by the Local Government Board and the parliamentary authorities. The electrical contemporary already referred to thinks the success of the Joint Bill is somewhat speculative. It also hints that the proposed promotion has been kept dark. What good purpose can issue from trying to veil the promotion is not plain, as opposition will have ample time to shape itself after publication of the notices. Working *sub silentio* was perhaps with the view of not saying anything about the movement if it proved abortive.

The War and Electricity Business.

The electricity supply industry and the gas industry will be found to have much in common in respect of the effects upon business owing to the circumstances arising out of the war—except that the gas industry will also suffer through the state of the residuals markets during the months already spent this half year. "Electrical Engineering" has been making an interesting inquiry regarding the effects among representative electrical undertakings; and we extract from the review of the results of the inquiry some of the general information. It is mentioned that the lighting load in London and some other large towns has been lowered on account of the diminution of street lighting, and still more owing to the compulsory reduction in intensity of shop-front lighting—the total drop varying from 5 to 20 per cent. as compared with last year. The power load has been increased in some localities and decreased in others. Clothing factories, practically all the engineering works, manufactories of woollen goods, and paper works have been running at high pressure and overtime, and have, therefore, drawn more power from the central stations. On the other hand, the cotton industry has been depressed, so that at Bradford and in various Lancashire towns there has been a drop in the load. Seaside places have suffered most from decreased output. At Brighton, for instance, the curtailment of street lighting, outside shop and advertising lighting, and the illumination of the piers has had a serious effect. Other watering-places have been affected in much the same way, although the reduction is not to be measured quite in proportion to the illumination of the sea fronts, which present a dismal appearance after dark, owing to the obscuring of the lamp globes by order of the Admiralty. Dover is an exception, as the municipal electricity works supply both the War Department and the Admiralty, whose electricity requirements have gone up considerably. In Plymouth, on the other hand, there has been a very decided drop in output owing to the restricted hours of lighting, due to orders from the War Department. Two districts where electric power consumption has increased greatly are Stepney and Poplar. In both the lighting load has dropped; but the power load has largely advanced—mostly due to the clothing factories now working overtime on Government contracts.

Tariff Irregularities.

Electrical engineers want someone upon whom they can rely to interpret for them the Long Eaton judgment and its confirmation by the Court of Appeal; for it is evident that to some of them what we thought was quite pellucid is terribly opaque. It has been highly amusing to see the different constructions that have been placed on the decision of Mr. Justice Sargant, and the expressive endorsement of it by the Master of the Rolls and two Lords Justices of the Court of Appeal. The "Electrician" commented upon the judgment, and when doing so made reference to the Ilford case. The Electrical Engineer (Mr. Arthur H. Shaw) appears to be somewhat irritated with our contemporary for having done so, and regards what they had to say as a prejudgment of his version of what is right and proper in the way of tariffs. Mr. Shaw states that the Ilford rates are entirely different from those in the Long Eaton case, and assures all concerned that they are based upon the principle to which our contemporary alluded when it stated: "From the account of the proceedings, it becomes evident that differentiation is legitimate when there is a difference in the cost of supplying two consumers." There was no decision to that effect anywhere in the case; but perhaps when the Ilford action comes on we may get the dictum of the Courts upon the point. Mr. Shaw very properly will not express any opinion on the matter of legality; being somewhat interested just now. But he does say that he considers the question of these rates is very much more important than our contemporary appears to believe; and that, if judgment is given against his department, "it will put a stop to all differential preferential rates." We do not think it is as bad as that. Differential rates are not necessarily preferential ones. Preference consists in giving one of two customers for a "corresponding supply"—lighting supply, power supply, heating supply, or cooking supply—a preferential charge though the circumstances of the two "corresponding" supplies may be "similar." If electric undertakers will look at the conditions with which so many of them have environed their tariffs, they ought to be able quickly to see where they have set up a preference in the case of "corresponding" supplies. There cannot be any objection to a differential price or a discount in the case of a "corresponding" supply, where one customer is a larger patron than another. The electricity industry, however, have gone beyond all that, and have abused right and left the principles of commerce, and incidentally they have set up illegal preference. Even under certain of their tariffs, undue preference is given, and injustice is done, and as long as this can be hidden from the consumers (who do not know much about the matter), and there is no complaint, so long will the electricity purveyors go on with their breaking of the law, and some of the consumers are the victims. It is just as well, now that a commencement has been made with the adjustment of these irregularities, that a clean sweep should be made of them.

Electrical Tactics—Various.

In elucidating the judgment for the instruction of his readers, one of the writers in "Electrical Industries" makes the intelligent statement that what the Long Eaton Council must not do "is to make power users pay 1d. per unit instead of ¾d. if their premises are not wholly lit by *gas*." Had this been so, we do not think the Long Eaton Gas Company would have troubled about the matter, and caused the Council to defend their action at the Law Courts. Mr. Vesey Knox, K.C., will also be highly flattered when he learns that the same writer considers that learned Counsel was "reduced to a number of arguments about large generators and varying load factors, which were quite beside the mark, and gave the false impression that the adjustment of rates of supply to the character of the demand was in question." There is a further interesting point about the comment of this electrical expounder of the law. He says that the action of the Long Eaton Council, as a matter of tactics, was both bad and unnecessary. "It gives the impression that the electric supply undertaking finds it necessary to bribe consumers into using electricity exclusively." There are many more electrical administrations than the Long Eaton one who have taken very great pains, through their tariffs and the conditions formulated for supply, to make this impression sink as deeply as possible; and therefore to the electrical trading optimists it must be a great satisfaction that the Long Eaton Gas Company took the necessary steps to, in a sample case, have removed the tactics that give the distasteful impression as to the need for bribery. As far as the use of electric energy for power purposes goes, the same writer points out that the arguments in favour are admitted by gas undertakings themselves "since they use electric-motors freely in their own works." How wise, and how just! Power is required for myriads of purposes. For most power purposes gas is more economical than electricity; for a few purposes, electricity is more convenient than gas. For travelling machinery and raising and lowering the working parts of machinery, electricity has an advantage over gas, and that is why gas engineers—not being narrow-minded fools, and not unwilling to give points where favourable to a rival—use electricity. Yet they are mostly, where not tied by municipal considerations, loyal to gas, in that they demonstrate how on a large works the gas-engine can generate current for all and every purpose—both lighting and power—at a cheaper rate than the electricity suppliers can profitably supply at. But writers in some electrical papers, with crabbed minds and destitute of sportsmanlike instincts, will state the fact of use on gas-works, but hide the peculiar conditions of use from their readers.

A Failure of Judgment.

The "Electrician" has made the following acknowledgment that the member of its staff responsible for the commercial section of the paper exceeded the proprieties in recently characterizing the writer of "Electricity Supply Memoranda" a "l——r" in regard to his references to the Romano electric-grill:

> The "Journal of Gas Lighting" animadverts strongly on an expression which has been used in this column. We fear our worthy K.V.A. has allowed his valour to overrun his judgment in applying an unjournalistic term to our worthy contemporary K.V.A. is a writer who invariably calls a spade a spade, but we question whether there is any good purpose served in upsetting the amenities between ourselves and our always polite, if not always strictly accurate, contemporary.—G. T.

As "K.V.A." repeated the expression, it would appear that his "judgment" is something of a very unstable character. "Judgment" also failed him in seeing that there was nothing in the original paragraph on the Romano electric-grill which justified his descent into vulgarity. The term, too, under the circumstances, was not applied to the "JOURNAL," but personally to the writer of the "Memoranda." Let it be understood once and for all that the writer does not mind jokes, and such shallow ones as are occasionally levelled at him by his electrical contemporaries. Little digs on points of controversy do not in the slightest degree disturb him; he is generally able to get one in in reply. But attacks on his personal or journalistic honour, he is not prepared to accept quietly. Had our contemporary not made the acknowledgment which we quote (poor as it is) other steps would have been taken to set the matter right.

At next Monday week's meeting of the London Section of the Society of Chemical Industry, Mr. E. V. Evans, F.I.C., of the South Metropolitan Gas Company, will read his paper (deferred from the meeting on the 2nd inst.) on "The Removal of Carbon Bisulphide from Coal Gas."

THE AMERICAN GAS INSTITUTE MEETING.

Statistics of Attendance.

It will have been gathered, from the account given by a correspondent in the "Journal" a fortnight ago, that the recent annual meeting of the American Gas Institute was an all-round success. This is fully borne out by the following extract from the "Gas Institute News" for the current month, which has just come to hand.

With a registration of 633 members and 220 guests of both sexes, the 1914 meeting exceeded by far previous records. As shown by the section statistics [see below], this large gathering was exceptionally faithful in attendance at the various sessions; and never has there been as full discussions. The membership has demonstrated conclusively that they can be counted upon to talk if interested in the subject and given time enough. Anyone who went from one section to another, and found in all a well-filled room and an interested audience, will endorse the general feeling that by section meetings both the quantity and the quality of the Institute's work has been increased. A comparison of the six hours used in discussion at the 1911 meeting with the nineteen-and-a-half hours employed in New York, tells its own story. Certainly, if the purpose of an Institute meeting is the exchanging of views, such an increased opportunity at no greater expense to members is well worth while.

The programme of the meeting was as printed except for the omission of the papers on "Ammonia Purification" and "The Fusibility of Ash in Coals Used in Gas Making," and the addition of a paper on "The Separation of Illuminants in Artificial Gas." It is sufficient to say that the success of the Manufacturing and Distributing Sections was as pronounced as at Richmond; while the new sections—Chemical, Illuminating, and Accounting—fully justified their creation, and took steps to continue their existence under the revised constitution. This revision, which will come into effect in September, 1915, provides better machinery for section work. Incidentally, it raises dues by 50 per cent.; but no one who was in New York—especially if he heard the testimony at the first session to the value of the services of the Public Relations Committee—thinks his membership is not worth the increased amount.

In addition to the fidelity in attendance, the promptness with which the sections were called to order was a feature. Also, authors seemed to have learned the lesson that every minute they save in the presentation of their paper will be used in honouring it in discussion. The efficiency of the system by which the audience of any one section knew at all times what was going on in the other sections made it very easy for members to go from one section to another to hear the papers in which they were most interested.

The entertainment features were very enjoyable, though not so extensive as at Richmond, for it was felt that with the many attractions of New York City a long set programme was not wanted. The Committee on Arrangements was unusually efficient, and, with President W. H. Gartley and the other officials who during the year worked for the success of the meeting, deserved all the praise that was so willingly given them.

The following are some statistics of the meeting:

Attendance at Sections.

	Minimum.		Maximum.
Manufacturing	67	..	296
Chemical	21	..	49
Distribution	72	..	142
Accounting	27	..	98
Illumination	26	..	85

Time Study of Meeting in Comparison with Previous Meetings.

	Hours.		
	1911.	1913.	1914.
Addresses, reports, and presentations	4·5	3·4	3·9
Reading of papers	5·8	6·1	9·0
Discussing papers	6·1	8·5	19·5
Total time utilized	16·4	18·0	32·4
Time lost by tardiness in assembling	1·7	2·6	1·8
Total possible session time	18·1	20·6	34·2

A study of the above table indicates very clearly the progress made in three years in providing discussion time for the Institute members. If data were obtainable for the 1910 meeting, the comparison would be still more striking, as the start of section meetings was in 1911, while the Institute in 1910, as one body, probably did not spend more than four hours discussing papers.

POINTS FROM THE PRESIDENTIAL ADDRESS OF MR. W. H. GARTLEY.

As mentioned by the Correspondent who sent the epitome of the proceedings at the annual meeting of the American Gas Institute that appeared in the "Journal" for Nov. 10 (p. 291), the address of the President—Mr. W. H. Gartley, of Philadelphia (Pa.), dealt with the purposes of the Institute and the work it does through its Public Relations and Technical Committees. It may be of interest to reproduce some of his remarks on these points.

In opening his address, the President referred to the pleasure he felt in welcoming the members of the Institute to the forty-second consecutive annual convention of the gas men of America—"a country still rich in the natural resources of our business, enjoying the advantages of peace, abundant products of the farm and field and factory, and a people well acquainted with the advantages of our product as a lighting and heating agent for both domestic and industrial purposes." He continued: "Fate has ordained that those countries whose people have shared with us in the building-up of the *technique* and practical development of the gas business should now be engaged in a bitter and destructive conflict; and it becomes us, in a chastened spirit of humility and thankfulness, to extend to our contemporaries in those countries our sympathy, and particularly to the members of the Belgian Gas Association our extreme condolence that they should find their country devastated, and its people wanderers because of a war in which they appear to have taken no initiative."

Passing to the subject-matter of his address, Mr. Gartley pointed out that the Institute was about to start on its tenth year; and he said it seemed to him to be worth while to present to the members a brief review of the manner in which it had performed the duties contemplated by its founders. Having read extracts from the address of the President at the first meeting after the constitution was presented and adopted in an amended form, he proceeded as follows.

Work of the Institute's Committees.

The constitution provides that the work shall be conducted under three general headings: (1) The work of the Public Relations Committee; (2) the work of the Technical Committee; and (3) the co-operation of research work and the cultivation of intimate working relations between the State Associations and the National Institute.

The work of the Public Relations Committee has been conducted in such a manner as to fulfil the purposes of the founders of the constitution. It has become a recognized authority; it has created confidence in its scientific accuracy. Throughout the history of the Institute the work of the Public Relations Committee in conferences with the Bureau of Standards at Washington, investigations leading to the fixing of standards of quality, hearings before State Commissions, the reviewing of proposed regulations, the subject of workmen's compensation laws, and other laws affecting our business, is well known to many of you, though the modesty displayed in the reports of the Committee gives but slight indication of the value of their activities.

The Technical Committee may well claim to have performed all the functions that were assigned to it by the constitution. The papers which are presented to the Institute, and which to a great number of the members constitute their most intimate association with its work, are of a standard beyond adverse criticism. Our "Proceedings," in reality, constitute more than any other publication American gas practice in every operation, excepting commercial work. The reports of the Institute's Committees on special subjects constitute the final authority on these subjects.

Co-Operation of Members.

This convention is the forum in which gas men meet for the presentation of ideas before a critical audience, and much might be said in detail as to the far-reaching effect that has been produced by the papers contributed. I have in mind one comparatively simple, short, practical paper presented some seven years ago, the author of which told me that no subsequent year has gone by since its publication that he has not received inquiries and discussions by mail from all parts of the country. The great principle involved in the presentation of these papers is co-operation, as opposed to a narrow spirit of self-interest. My earnest advice to every member of the Institute who desires to place himself on record as having carefully and systematically set down a full knowledge of some detail of the business, or who wishes to have his mind emerge from a hazy general conception and "rule-of-thumb" ideas on some subject, is for him to prepare a paper, and submit it to the Technical Committee. In no way can a man better master a subject or determine for himself and others the scope of his ability in connection with the business.

The Institute and State Associations.

As to the third general purpose of the work of the Institute, it may be said, and too hastily said, that the result of the nine years of operations has failed to carry out, except in a very small degree, the ideals of the founders of the Institute. Four State Associations only have formally affiliated with the Institute, and the results of affiliation as outlined in the constitution have not been realized. It was intended that the Institute should confer with and assign to the State Associations some line of research to be carried on under the supervision of the Technical Committee of the Institute; and the State Associations were to make certain agreements as to the limitation of qualifications for membership, among them being that each Association was to confine its membership to the district covered by it. It appears that, from some unfortunate wording in the declaration of these purposes in the constitution, or by some unfortunate misconception of the purposes of the Institute, the local Associations have felt that the Institute was endeavouring to curtail their liberties, to direct their activities, and to assume a control over their procedure that they are not willing to grant. And yet I am confident that there

are men now before me, strong advocates of the usefulness of the local Associations, who are convinced that the work of the Institute has been of prime importance to the State Associations and to the gas interests represented by them.

Particularly do I refer to the work of the Public Relations Committee, who have been vigilant in watching the development of legislation and the trend of regulation by State Commissions in all portions of our country, whether or not represented by an affiliated Association. It is my opinion that the idea expressed by the founders of the Institute in suggesting affiliation with the local Associations will yet be found to be one of great importance; and I suggest that this matter be taken up now so as to determine exactly what can be done to bring about a closer bond between all the Associations. I have had the thought that there might be combined with the headquarters of the Institute, a department which could be called a "Bureau of Statistics," supported by contributions from the State Associations, and to work in conjunction with the Public Relations Committee in doing the work which can be done, as I see it, by the Public Relations Committee of the Institute alone—viz., the furnishing to State Associations of data, information, and arguments that have been presented to other State Commissions in solving the same problems.

It has been important that the Institute should associate itself with certain other organizations, and contribute to carrying out purposes well defined and bearing on our trade. Among these are the International Commission on Illumination and the National Fire Protection Association, and such combinations as are represented by our Committee on Electrolysis.

Regulation by State Commissions.

At the time of the first report of the Public Relations Committee of the Institute in 1907, in which they stated "that the change from the policy of open competition as a regulating force and secret accounting to State supervision and regulation with public accounting is not inimical to the interests of the owners of gas properties, provided it is accompanied by protection to the values of the properties supplying the public need. Such protection is as necessary to the public interest as to the corporations. Since without it capital cannot be secured to make necessary extensions and improvements," there were three States that had adopted State Commission control of public utilities. To-day 47 States and the District of Columbia have followed their predecessors, and, with one exception, all the States in the Union have now State Commissions for the regulation of public utilities. Of these, 28 have authority to impose regulations on gas companies; 15 of the latter have published or adopted proposed rules; and 5 others are known to be formulating similar rules.

The result of this supervision by men of judicial minds, whose business it is to become thoroughly acquainted with the operations of public utilities in order that justice shall be done to the public as well as to the capital invested in the companies, has developed several facts of interest. The first of these is that the gas companies, upon competent investigation on the part of the Commission, particularly after the Commission has become well informed of the state of the art of gas making, with its marked peculiarities not encountered in any other public utility business, have been found to have very little to condemn in the conduct of their business. If injury has been suffered by the public through the operation of other public utilities, the gas companies were found to have been conducting their business in an intelligent and careful manner, been maintaining a good quality of gas, and performing good service to their consumers.

Another fact is that the regulations of the Public Utility Commissions, as they have developed year after year, have strengthened the position assumed by many gas engineers, that the quality of gas delivered to the consumer in the great majority of cities was not only extravagantly high, but that a lower quality of gas in many cases would have given better service. This statement, appearing to the untrained mind as an absurdity, upon careful investigation has been proved to be correct. It has for some years been held by engineers and experienced gas managers that a gas of 570 heat units would, on the whole, for the numerous uses of gas, be more satisfactory than one of 600 heat units; but it was not until the last two years that any Public Utility Commission has felt itself secure enough in its position to set the standard so low.

A third and most important point has been made prominent. No country-wide general laws can be laid down regarding the quality that is at once applicable to every gas company's situation. But, on the contrary, the companies of each State must be examined as to their own local conditions by an experienced Commission. To attempt, for instance, to advise all State Commissions that some one standard of quality should be required of all gas companies is to court a loss of respect by State Commissions for the value of this source of advice. On the other hand, I believe that a State Commission should not yield to the temptation to impose more severe standards of quality on the more important gas companies within their control, and less severe on the smaller companies.

No Commission has yet adopted a photometric standard, but one has adopted a dual standard of calorimetric and photometric values; and this, in Ohio, is a peculiar case in which, owing to a large quantity of natural gas, they require 800 heat units for the natural gas, and 600 heat units and 12-candle power for artificial gas. All Commissions so far fixing standards of value for gas have agreed that the gas should be measured according to its heating value. And yet to-day there is more gas being made under candle-power requirements than under heat-unit requirements. The causes for this condition are diversified—existing municipal laws, contracts, and inability to make changes quickly on the part of the gas companies under conditions peculiar to localities; and conflict of authority between State Commissions and Municipalities are some of them. While each case must be decided on its merits, it is believed that the country at large is coming to a heat-unit standard.

On the whole—and I say this with full realization that some members of the Institute will not endorse my statement—the operation of the gas business under the regulation, inspection, and control of judicial bodies, well informed as to the art of gas manufacture, distribution, and sale, giving an opportunity to show, not only by argument but by inspections and tests, the justice of their position and get decisions based thereon, is of advantage, and would not willingly be changed by the gas companies. It has been helpful in taking the gas business out of the field of partisan interference, and putting it on a stronger basis. Writers on economics now assert with confidence that public utilities, such as gas supply, are "natural monopolies." One Justice of the Supreme Court calls them "necessary monopolies;" and the theory now meets with general acceptance that the supply of artificial gas in any district can best be conducted as a "natural monopoly," subject to State regulation. While we are accustomed to this idea in this year, how venturesome we would have considered a president of a gas company ten years ago who dared, in the face of public sentiment, to maintain such an attitude.

The Wisconsin Commission states that all public utilities should be operated under an "indeterminate franchise," or an "indeterminate permit," by which the public, either Municipality or State, at certain times may purchase the plant and business under conditions which will secure to the company the right to appeal to the Courts to get justice in the matter of value. Perhaps, with fair dealing and open justice, a gas company would not be unwilling to be forced to sell to a municipality; and the idea of municipal operation is still attractive to many minds whose high degree of intellectual development is accompanied by a rather low standard of practical common sense. Without diverging into a discussion of this feature, it can be said that, while the operation of utilities under State Commissions is generally believed to be as satisfactory an arrangement as has yet come within human purview, yet such objection to it as has so far appeared is due to the desire of municipalities to participate in the operation of utilities without their limitations. The officers and some of the citizens of the municipality are, here and there, not content that in their dealings with public utilities they shall have a court of appeal provided, made up of men well informed and expert in the workings of the utilities, but, being one party to the contract, they desire also to have some of the authority to control the other side by coercion through local ordinances or breach of contract—a most unfair proposition. Statistics show with such overwhelming force that the chances of success of municipally operated public utilities are less than those privately operated, that it would seem sufficient to convince the most sceptical. But the theory is an attractive one, and will continue until someone is able to present the entire case in such a manner as to dispose of it finally. The United States last three Presidents have declared their opposition to the governmental operation of inter-state utilities.

Decisions of State Commissions.

The first Commissions, in issuing regulations and general supervision over the affairs of gas companies, no doubt felt their responsibilities resting heavily upon them. They were entering a new field of judicial procedure, and were assuming executive functions the practical effect of which was as uncertain to them as to the gas companies. The Wisconsin Commission issued its rules prior to 1907 requiring a heating-power standard; yet it was not until 1913, after an elaborate general investigation by the Engineers of the Gas Commission of the Second District of New York and the Empire State Gas and Electric Association, that it was known definitely by gas men what difficulties and what possibilities of manufacture and distribution of gas lay in a heating-power standard. What is true of this one particular applies in general to all the relations between State Commissions and the gas companies.

With 48 Public Utility Commissions handing down decisions and rulings on all the intricacies pertaining to the business, the Commissions are now, and will be more so, hedged about with the great mass of precedents and opinions affecting their decisions and rulings, and these will gradually partake of a closer adhesion to prior decisions. An opinion or announcement of some new principle, acceptable to both sides, influencing the future of our business, may appear through the dealings of the State Commissions with some other public utilities, and in our own work the manager of a gas company, while endeavouring to comply with the Commission's rulings, will encounter such a mass of fine distinctions and apparent confusion of distinctions, that, to any but the legal mind specializing in this work, discouragement will follow bewilderment.

It becomes very desirable and necessary that these rulings and decisions of Commissions in their treatment of all public utilities shall be digested for us by competent legal authority, and presented in such a way that the decisions of all the State Commissions will be indexed and annotated, so that we may have with each decision reference to other previous decisions on the same point. The preparation of such volumes is a matter of great

importance, and will require considerable financial outlay. No decision by any State Commission can be trusted to be of merely local importance. The decisions of these Commissions must, if intelligently and fairly made, partake of much of the character of Court decisions, established on the laws of the State and based on the powers of the Commissions, and modified by their previous rulings and those of other Commissions. The preparation of such a document would therefore be not only essential to the gas companies, but might become of assistance to the laws of precedents. Steps have been taken to have published and distributed to subscribers from time to time a report and digest by competent legal authority, published in much the same way as the legal reports and digests now appear. I ask the support of the Institute in carrying out this work, and I suggest that some action be taken, looking to the cordial support by subscription of the publication of these volumes.

LABOUR DISPUTES DURING 1913.

Labour disputes, which during the last three years particularly have been so important an element in the industrial life of the country, have lately sunk absolutely into insignificance by the side of the wider and more vital problems by which we are confronted. But though quarrels over wages or conditions of work may just at the present moment appear trivial, they are not really so; and besides the figures which it is proposed to notice shortly now deal with last year—when the great nations at any rate were at peace with each other. At that time few of us indeed contemplated any kind of warfare more serious than a strike which might jeopardize the supply or enhance the price of some more or less necessary commodity. Since then there has been the awakening; and looking back, it is curious to note that the European upheaval was preceded by a year which was remarkable for the number of disputes which occurred during its course.

The Twenty-Sixth Annual Report of the Department of Labour Statistics of the Board of Trade on "Strikes and Lock-Outs" in 1913 (a copy of which has been forwarded by Mr. F. H. M'Leod) states, in fact, that the number of disputes in that year far exceeded those recorded by the Department in any previous year, and this period, it will be remembered, followed the national coal strike of 1912 and the disputes in the transport trades in 1911. The increase in the number of disputes in 1913 affected practically all the main groups of trades—and notably the building, metal, engineering and shipbuilding, and textile trades. There are practically 1500 disputes recorded as having begun during the year; and, in addition to this, 50 which began before the year were in progress for varying periods. The total number of workpeople involved in the disputes beginning during the year was 688,925; but only sixteen disputes involved 5000 workpeople or over, though they accounted for about 32 per cent. of the total number involved. Many of these large disputes were prolonged; and their aggregate duration accounted for just over 41 per cent. of the total number (11,484,534) of working days lost by all disputes beginning during the year. The number of workpeople involved in the building trades was the highest recorded; but the mining and quarrying industries had larger totals in several previous years. In the metal, engineering, and shipbuilding group of trades, the number of persons involved was higher than in any previous year recorded; the most extensive trouble in this group being the metal workers' dispute in the Midlands involving about 50,000 workpeople. Other big disputes concerned iron moulders in the Falkirk and the Sheffield districts. There was in 1913 no great general dispute in the engineering trades.

The fact that a large number of disputes does not necessarily mean a corresponding increase in the number of workers affected is proved by the fact that in 1913 the proportion of persons employed in industrial occupations who were involved in strikes and lock-outs was 5·6 per cent. of the total, as compared with 13·4 per cent. in 1912 (the highest figure recorded, owing to the national coal strike, though there were not much more than half the number of disputes), and the 4·4 per cent. which is the mean for the past ten years. Throughout this period of ten years the proportion of workpeople involved in disputes in the coal-mining industry was higher than in any of the other principal groups of trades. The proportion affected in this trade last year was exceeded in 1909, 1910, and 1912; but in other mining and quarrying and the metal and engineering and shipbuilding trades the proportions were higher than in any of the preceding nine years.

It is roughly estimated that the aggregate number of working days available for the whole industrial population is 3700 millions; and as the aggregate duration of all the disputes in progress during 1913 was something over 11½ million days, this represented nearly one three-hundredth of the total. Put in another way, it means that the amount of time lost owing to disputes in 1913, at the establishments immediately affected, would have been about one day per head if spread over the whole of the industrial population. The average loss of time in the mining and quarrying industries was about 1¼ days per head of the total number of workers employed; and in the metal and engineering and shipbuilding group it was about 1⅛ days.

Of the 1497 disputes which began in 1913, nearly one-half lasted under a week; and about four-fifths of the total were in operation for less than a month. These, however, did not include the disputes involving the largest bodies of workpeople. The principal causes of dispute were demands for higher wages and for readjustment of rates of payment; but disputes arising out of the assertion and defence of trade union principles also involved large numbers of workpeople. Dublin, of course, furnished the outstanding example of the latter form of trouble. But there were a considerable number of these disputes in the coal-mining industry. These consisted of refusals to work with non-unionists; one of the most widespread being the general stoppage early in May at all collieries in South Wales where non-unionists were employed. It is estimated that about 50,000 men in all were involved; but work was gradually resumed at the collieries as the non-unionists joined the union. Other causes of numerical importance were demands for the reinstatement of discharged workpeople and objections to certain officials; and there were also a good many disputes as to demarcation of work between various classes of skilled workpeople. Some of the reasons assigned for disputes appear trivial enough; but an example of "coming events," &c., is noticed in the statement that over a hundred bricklayers and labourers struck for one day on a certain job against the employment of foreign bricklayers. Work was resumed on the foreigners being removed. In South Wales, a thousand miners struck for three days, alleging that they had been prevented from attending the funeral of a comrade who had been killed at work; and even smaller matters caused trouble at several other collieries. The sympathetic strike, unfortunately, still remains far too popular.

Looking at the results, it may be seriously doubted whether the employees concerned really got their "money's worth." The approximate proportion of workpeople directly involved in completely successful disputes was 31 per cent. last year; while 21 per cent. were concerned in unsuccessful disputes, and 48 per cent. in partially successful or compromised ones. These figures are, however, it seems, better than usual; for the report states that excluding the year 1912, which was altogether exceptional owing to the large number involved in the national coal strike, the proportion of workpeople completely successful last year was much higher than in any of the four years preceding 1912, while the proportion accepting a compromise was lower than the average for the same period. Wages disputes last year were generally compromised; and only about 9 per cent. of the workpeople involved in disputes for increases in wages were completely successful. A better showing was made by men who fought over questions of trade union principle; for about three-quarters of those who were involved were successful—largely owing to the efforts in this direction of the South Wales miners. The unsuccessful ones of this class were mostly Irish. Sympathetic strikes were largely unsuccesful. This is a welcome feature, if it can be taken as showing that employers are determined at all costs to combat this particularly ruinous species of industrial warfare. Workpeople in the employment of public authorities are given a place by themselves in the statistics; and it is shown that of 26 disputes in which they were concerned there were only seven cases in which they were completely unsuccessful. But here, surely, figures are deceptive; for the smashing defeat suffered at Leeds must have done the union campaign more harm than was counterbalanced by the whole of the victories. Though the Leeds strike has long been dead, the example set by the Corporation still lives, and will certainly continue to live for a long while to come.

The second part of the report deals with the work accomplished during the twelve months by Conciliation and Arbitration Boards; and this may be noticed later.

GAS COKE FOR STEAM-RAISING.

By E. W. L. Nicol.

The following *résumé* of the first year's work of the London Coke Committee, so far as it concerns the technical aspect of the above subject, may be of interest, in view of the several articles which have appeared dealing with the introduction of gas coke for steam-raising in competition with natural coal fuel.

The propaganda now being conducted by the Committee in the Metropolitan area has established the fact that the chief descriptions of fuel competing against coke are anthracite, smokeless Welsh coal, and bituminous coal of the higher grades. It is mainly these which have, so far, been displaced by successful coke sales effected after practical tests under actual working conditions. The severity of these tests has often had to be accentuated by a persistent conservatism on the part of those responsible for the efficient conduct of steam plant; and they are therefore likely to be more satisfactory for this very reason. That something new (to many) in a field of enterprise presumably so well exploited should be proved to be more efficient under these conditions, is none the less gratifying to those interested in promoting the use of coke. The initial sales to steam-users, traceable to the Committee's propaganda, have been estimated at about 50,000 tons for the year.

Commercial Value of Coke.

A brief inquiry into the co-relation of the chemical composition and cost of the competing fuels is necessary in order to arrive at the precise relative commercial value of gas coke as a steam-raising fuel. Their approximate cost in the London area at

current rates, and other important factors which determine their efficiency and economical utility, are tabulated below, and, for

Table of Comparative Fuel Values.

Competing Fuel.	Fixed Carbon.	Ash.	Hydrogen.	B.Th.U. per Lb. Dry.	Cost per Ton in London.	B.Th.U. per 1d. of Cost.
Coal.	Per Cent.	Per Cent.	Per Cent.		s. d.	
Anthracite. . . .	92·0	3·0	3·0	15,000	25 0	111,000
Welsh, good quality .	87·3	3·06	4·0	15,200	29 6	95,760
Welsh, smokeless navigation . . .	80·0	3·4	4·04	13,960	25 0	103,300
Welsh, average quality	76·0	3·0	4·65	14,140	24 0	108,800
Scotch navigation .	70·6	2·6	4·8	13,760	23 9	107,328
Bituminous, Nottingham. . .	57·1	8·0	5·11	13,000	20 0	120,900
Bituminous, washed nuts*.	45·6	10·0	5·45	12,250	17 6	129,800
Coke.						
Foundry coke . .	90·0	7·0	0 5	13,500	28 0	94,500
Gas coke, from good quality coal, broken and graded . . .	88·0	8·0	0·5	13,100	20 0	121,800
Do. . . .	88·0	8·0	0·5	13,100	18 0	134,900
Do. . . .	88·0	8·0	0·5	13,100	16 8	146,700
Gas coke, average .	86 0	..	0·5	12,000†	20 0	111,600
Do. do. .	86·0	..	0·5	12,000†	18 0	123,600
Do. do. .	86·0	..	0·5	12,000†	16 8	134,400

* Moisture content, about 10 per cent. † As sold, including moisture and ash.

comparison, various prices and calorific values for coke are appended. The competing fuels are no doubt sold with regard to their actual evaporative power; but it will be observed, after a brief study of the table, that the prices vary not so much in proportion to the calorific power as in direct relation to the fixed carbonaceous content, and inversely as the hydrogen and ash content. In other words, these fuels are valued by buyers not on the basis of the total calorific power as observed on a calorimetric test, but on their actual heating value, since a highly bituminous coal may have a high calorific power but a relatively poor heating value. The comparatively high carbon and low hydrogen content of gas coke, combined with its smokeless characteristic, should therefore place it very high in the scale of commercial values; and it is to be hoped that the pioneer work of the Committee in demonstrating to steam-users the advantages of coke fuel will hasten its being appraised by the latter at its proper value.

Adaptability of Coke Fuel.

An engineer who is in a position to speak with authority on the subject has said that 90 per cent. of the steam-boilers in London are overloaded. Steam-boilers are, moreover, invariably designed and rated for coal fuel, which may be consumed under ordinary conditions at rates exceeding 40 lbs. per square foot of grate area per hour when heavy intermittent demands for steam have to be met; and existing grates, with natural draught, of average intensity, are not adapted to burn the comparatively slow-burning coke fuel. An ordinary sized Lancashire boiler, 8 feet in diameter by 30 feet long, having adequate draught available, will evaporate about 8500 lbs. of steam per hour, and will burn coal at about 25 lbs. per square foot of grate area per hour. In order to maintain an equivalent rate of combustion with coke fuel, the necessity for an inexpensive and efficient forced-draught apparatus, so as to supplement the usually inadequate natural draught, was from the beginning recognized by the Committee, in order to extend their field of operation beyond the limit of the remaining 10 per cent. of steam-boilers; and the development of such an apparatus has so far been completed that arrangements have been made with a City firm of engineers (Messrs. Ross and Schofield) for the supply and fixing in the London area, at a cost per boiler that would in most cases be equivalent to considerably less than a week's fuel supply. The apparatus operates on the steam-jet injector principle, and has been designed to promote an equal rate of combustion over the whole grate area with a minimum steam consumption. It can be fitted without drilling or cutting the boiler plates, and, if necessary, without even taking the boiler off load.

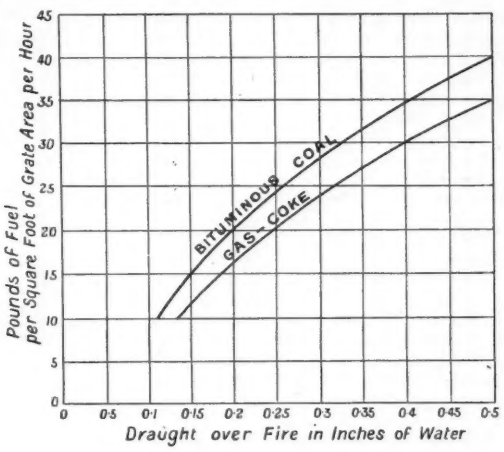
The efficiency of the steam-jet air-injector is not to be compared with fan-impelled draught. To all but a few, the luxury of the latter system is, however, denied on account of its comparatively high initial and maintenance costs. It is not likely to be installed expressly to burn coke fuel; while even the cheaper steam-jet furnaces—many excellent examples of which are at present in use—are out of the question when it is one of substituting coke for coal. The advantages of forced draught, assuming that the steam used is limited in quantity, are seldom disputed; and the offer at the cost of a few pounds of such an apparatus, which will enable the stoker to keep a steady head of steam independently of varying atmospheric conditions, and which will, moreover, respond quickly to any suddenly increased demand while using smokeless coke fuel exclusively, should receive more favourable consideration.

The apparatus has now been for some months in successful operation in several factory boilers, and in one case the saving in fuel cost effected by its use with graded coke fuel is more than 20 per cent. In addition is the relief from the risk of prosecution for the emission of smoke; while the steaming capacity of the boilers has remained unimpaired, notwithstanding the additional steam necessary for the jets. This very considerable saving is not entirely due to the lower cost and higher efficiency of coke fuel, but is an indication of the very inefficient methods that are often adopted in burning coal without causing excessive smoke, and the more efficient methods possible in dealing with non-volatile fuel.

Comparative Rates of Combustion.

Under ordinary natural-draught conditions the variable factors which determine the rate of combustion of gas coke with a given air pressure are: (1) Density, (2) volatile content, (3) ash content, (4) grade or size, and, to a lesser degree, moisture content. It is recognized that any attempt to improve (1) and (2) would involve serious losses in the production of coke, which is a bye-product in the manufacture of coal gas; but breaking and grading to suitable size improves not only its possible rate of combustion and realization of heat value but also the calorific power, as a considerable proportion of the included non-combustible matter is eliminated by the very act of breaking and screening. For these reasons it has been recognized that the tendency will be for buyers to specify graded coke for use in steam-raising. The three standard grades adopted by the Committee are No. 1, over 2-inch mesh; No. 2, through 2-inch and over ¾-inch mesh; No. 3. through ¾-inch and over ⅜-inch mesh.

It has been found impracticable to accurately estimate the rate at which coke may be burned in any particular boiler-furnace by merely measuring the draught over the fire, as this factor naturally varies with the density or resistance of the fire, as well as with barometric and other conditions. The volume of air entering the furnace must also be ascertained in order to form a basis of comparison. The diagram shown indicates approximately the comparative rate of combustion of bituminous coal and average quality graded gas coke (No. 2 size) under various degrees of draught intensity and ordinary hand-firing conditions.



The principal industries and institutions represented in the list of steam-raisers now using coke fuel under boilers are: Factories, dyers and cleaners, laundries, breweries (for brewing and steam-raising), hospitals, clubs, and electric generating stations. Coke users also include the proprietors of motor omnibuses and commercial motors and a small electric lighting station which had previously obtained an average evaporation of 5·9 lbs. of water per pound of fine coal slack—a very good average having regard to the extreme variation of the load dealt with. The average evaporation realized with broken coke under similar conditions is over 8 lbs. of water per pound of fuel (from and at 212° Fahr.). On other trials, when suitable testing apparatus was available, over 10 lbs. of water has been evaporated per pound of graded gas-coke, as fired.

Sulphate Market in Germany.

The "Chemiker Zeitung" of the 27th ult. reports that the demand for sulphate of ammonia in Germany has continued to increase in consequence of the supply of nitrate having been cut off. The question of meeting the requirements in artificial fertilizers is very pressing. About 12s. 9d. per cwt. was being asked for nitrate, packed, f.o.b. Hamburg, although later the military commander at Altona fixed a rather lower maximum price. The stocks of sulphate were small; being insufficient in the East and only just sufficient in the West to complete deliveries for which contracts had already been made. Fears that the coke-oven works would endeavour to make a very high profit from sulphate had not, however, been justified; and it was likely a maximum price for sulphate would be fixed by the German Government.

The next meeting of the Illuminating Engineering Society will be held (at the Society of Arts rooms) on Tuesday next, when a discussion will be opened by Mr. Leon Gaster, on "Illuminating Engineering in War Time: Some Lessons to be Learned from the Present Lighting of London."

SOME STUDIES IN THE MICROSCOPIC EXAMINATION OF COALS.

By Samuel Glover, M.Inst.C.E., F.R.M.S., of St. Helens.

[A Paper read before the Southern District Association, Nov. 12.]

[See *ante*, p. 358.]

The author having been "commandeered" by the Secretary to redeem the promise made by the President that coal sections should be exhibited under microscopes to the members of the Association, he has had the sections and lantern slides which are exhibited to-day prepared by Mr. James Lomax, A.L.S., at whose laboratories in Bolton the most successful method of doing this work has been developed; and the excellency of the work has enabled floods of light to be thrown upon a long-buried and dark subject. The sections are quite new ones; they having been cut from sample blocks sent at the author's request by members of this Association.

These samples are not to be regarded as indicating the nature and quality of the whole seam of coal from which they have been taken; and in speaking of them a tabular number, and not any names, will be referred to. The need for this care will be better understood by the members after they have inspected the sections of a complete seam of coal, one of the first ever shown; and the more the subject is studied, the more does it prove the wisdom of those whose practice it is to examine and test the whole depth of a seam of coal before concluding that they know all about it.

The microscopic study of coal formation also proves that the same seam of coal may vary in composition and quality when obtained from different areas or different levels of the seam, owing to the fact that whenever the carboniferous period existed environment influenced development and the seasons and crops varied under varying influences. However, it will be found that not all pieces of dark rock which come out of a coal pit are coal. It will also be found that coal is not as black after all as it looks when seen in bulk, and quite a different appearance is put upon the face of things when you can see through them.

The microscopical examination of coal has been practised more or less successfully since the year 1854; but it is only within the last two or three years that it has been possible to make large sections sufficiently thin and transparent for microscopical purposes. Formerly, small sections only were in use; such sections being of little value in determining the true nature of the coal substance.

The method lately practised is to make as large sections as possible, according to the nature and bedding of the coal seam. A seam of coal to be examined thoroughly should have a series of vertical sections made of its whole thickness, commencing from the floor upwards. Sections thus made can then be examined, and their various bodies and structures can be seen lying upon each other as originally deposited. Also the horizontal sections (parallel to the bedding) should be made of the various portions to show the different bodies in their horizontal plane. In the horizontal plane, in the majority of cases, there is no distortion of the structural parts of the various seed-like and other bodies which are to be seen in the vertical sections all compressed and flattened.

By these means a fairly accurate estimate of the quality of a seam can be determined—whether it is likely to be volatile or non-volatile, coking or non-coking, good or bad for gas-making purposes, anthracitical or semi-anthracitical coal, and, above all, the various coal substances, such as resinous bodies or bands, humic matter, leaf-like and otherwise, their sequence, changes, and the effect they probably may have on the spontaneous combustion of such coals when stored, and also as to the possibility of its being the cause of inflammable dust explosions.

A number of samples of coal (21 in number) have been obtained from various seams of coal used by members of this Association. Sections have been made from these samples, and micro-photographs (by colour photography) have been made from the sections showing the varying characteristics of each. When these are examined, it will be found that there is in many cases a wide difference between one seam and another. Some are very black and broken up, and full of fine joints filled with mineral matter, chiefly calcite; others are homogeneous, compact, and dull red in colour; some are banded, having alternating bands of resinous matter of bright yellow, between which there are laminæ of a red colour composed of leaf-tissues. Others show a preponderance of microspores and megaspores, the fructiferous organs of the Lycopods of carboniferous times. Then fructiferous cones, seeds, various kinds of vegetable or wood tissue can also be found, perfectly preserved, all lying in the coal in a natural sequence, showing that the vegetable matter now forming our coal seams has been laid down in a natural and slow order from the droppings of the carboniferous plants. Some of these have been trees of very large size both in height and girth; being quite as highly organized in their vegetative and fructiferous organs as many of the trees of recent times.

It has been asserted by various authors that the carboniferous age was an age when the atmosphere was charged with a large amount of carbon dioxide and watery vapour. Microscopical examinations of coal, combined with a similar study of fossil plants, both as impressions and petrifactions, show, by the nature of their vegetation and fructiferous organs, that the plants of the carboniferous period could not have existed if there had been an excess of carbon dioxide or watery vapour. The probability is that the atmospheric conditions were very little different from those of recent times. Fossilized trunks of trees have been found upwards of 60 or 70 feet in length. Some of these have been traced considerably over 100 feet in length. One stem has been reported upon which was over 114 feet in length. This was discovered lying on the top of the Arley seam at Bolton. It was described as being a straight trunk for that length, after which foliage and fructiferous branches were traced for a further 40 feet, all lying naturally on the top of the coal just as if it had fallen over through the decay of the lower portion of the trunk. In close proximity there were many other similar trunks to be seen, showing that there had been in this region a carboniferous forest of tall, straight trees having high crowns of foliage and fructiferous branches. Many other examples of a like nature have been described. Trees of this description could not have grown at all if there had not been a large amount of sunlight penetrating the atmosphere in which they existed, whatever was their botanical character.

All seams of coal so far examined show one peculiarity in common. That is, that the lower portion is composed of fine humic matter, which in many instances has been derived from fine leaf-like humus, having among it large numbers of resin-like particles. The source of this it is concluded, from accumulated evidence, is ferns—beautiful fern sporangia having been frequently discovered and fern-like plants of several orders, the foliage of which is often found as impressions in the roofs of coal seams. The remains of equisetinæ (calamites, &c.) are also to be found in the lower portion of some seams; the spores and sporangia being very common. The leaves, seeds, and vegetable tissues or cordaites are common in some seams. Much of the resinous matter already mentioned would be given off from the fern-like plants and cordaites, while much of the leaf-humus would be made up of the foliage. The leaf, bark, and resinous droppings, the decay and death of such growths as the above evidently formed the humus in which other vegetation afterwards rooted and grew, which could not have developed except there had been some such humus suitable to their propagation. Especially would this be so with the lycopods embracing the *sigillaria*, *lepidodendron*, *bothrodendron*, &c. It has been ascertained by experiment that to produce some of the recent lycopods from spores takes a period of from seven to twelve years; they having to be propagated in a suitable humus. Therefore there is no reason to suppose that during carboniferous times the period and conditions for propagation from spores would be different.

All seams containing lycopodaceous spores contain in their composition evidence that there has been a gradual development, and not a quick transition to the growth of lycopodaceous plants. Usually what is found is a gradual increase in the number of microspores as we ascend in the examination from the floor of a seam upwards, and less of the leaf-like humus which is dominant in the lower portion of the seam. The microspores are the fructiferous organs of the *lepidodendron*. These spores, together with the foliage, become in many seams the sole constituents for a considerable thickness. Coal of this composition is of a dull, slaty black colour, very tough and hard. On the other hand, in some seams the foliage and fructiferous organs of *sigillaria* and *bothrodendron* may have been the dominant class of plants from which the coal substance has been derived. When this is so, the coal is much brighter looking, having a slaty or bone-like surface. This is owing to the large numbers of megaspores in its composition. The megaspores are, broadly speaking, the female fructiferous organs of the *sigillaria* and *bothrodendron*. Both genera have fructiferous cones bearing both microspores and megaspores, male and female, such being termed hererosporous. In contradistinction, the *lepidodendron* are monaceous, having fructiferous cones with microspores only. Coals of the above composition are spoken of as true spore coals; being hard, good, and clean. Some of the seams have a thickness of 3 feet or more, consisting wholly of megaspores and microspores; others may have only a thin stratum of spore coal. Some may be a mixture of spores and humic matter, neither predominating. Others, again, may not have either megaspores or microspores; or microspores alone may be plentiful.

It will be seen by the above that the lower portion of a seam consists of humic matter derived as a rule from plants which differ from those in the upper portion. Coal of this kind is always soft and fragile, breaking up into small pieces upon exposure. Above this lower portion the coal may become more compact, some changing to a hard spore coal of variable thickness. Generally speaking, spore coals are covered in the thickness of a seam by a semi-spore coal, and, ultimately, by a pure humic coal near the roof. This condition may exist for a considerable thickness, or may be thin and interposed. There may be a band of dirt, warrant, or hustle, on the top of which there may be another bed of coal similar to that in the lower portion of the seam with a similar variation of detail. Some seams contain four or five beds of this character. It is generally found that the upper beds of a seam are inferior in quality to those below, containing frequently more thin dirt bands, pyrites, both in massive pieces and in strings, and also they are found to be more liable to spontaneous combustion. This being so, it follows that the vegetable *débris* from which the coal has

Fig. 1.—A spore coal. The photograph shows four intervals in its deposition, clearly indicating four seasons of the shedding of the spores and humic matter. The division of each is shown by the transverse cracks; while it will be noticed between these that the quantity of megaspores increases to the centre, after which they decrease, denoting the seasons' commencement and decline.

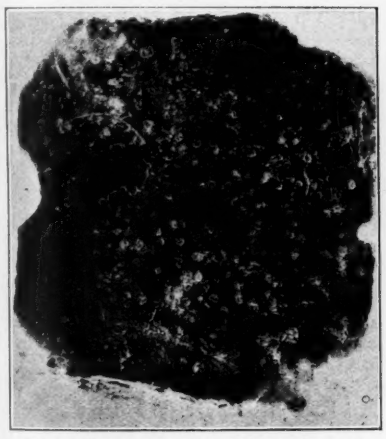


Fig. 2.—A horizontal section at right angles to fig. 1, cut through one of the bands. It shows the megaspores in their lateral or horizontal plane.

Fig. 3.—A vertical section of a fine humic coal, composed of fragmentary leaf-tissues, with here and there thin flakes of resinous matter.

Fig. 4.—A horizontal section of fig. 3; the darker portions indicating numerous resinous bodies, shown in the vertical section as white more or less oval bodies.

Fig. 5.—This view is taken from the same section as fig. 4, and shows the resinous bodies better, in a ground mass of fine humic matter.

Fig. 6.—A horizontal section of fig. 5. The darker portions are less resinous than the light, and may be regarded as true resinous bodies.

been formed must have been different, or undergone some change subsequent to its deposition, or during its deposition—material which makes it so much inferior, accumulated from sources which at present are not definitely known. Many seams have dirt partings, from less than 1 inch to more than 24 inches thick—some argillaceous or clay-like, others black and fuzzy, while some are a mixture of partly carbonized wood tissues and clay-like matter. Partings and bands of this character in some localities are very irregular, being thick in some places, and thin or missing altogether in others. They give one the impression that they have originated through some great destructive force in local places—such, for instance, as forest fires, is the suggestion of one who has studied the subject from many points; the mixture of argillaceous and partly-carbonized matter being, so it is thought, the ash remains after the destruction of the vegetation in the locality of its occurrence.

These bands cannot be accounted for through a subsidence having occurred whereby swampy places, pools, and small lakes of water have been formed; for if this had been so we should have evidences of animal life, fresh water or marine, such as those which are found in the roofs of coal seams. Moreover, the absence of silica, flakes of mica, &c., tends to prove that the source of the clay-like bands could not have been outside the forest area in which they occur. If they had been washed in from outside, then some portion of the bands would have been more or less sandy, and would have contained evidence of animal life, such as occurs where a band of cannel coal overlies a bed of humic coal. Cannel coals, on the other hand, have undoubtedly been deposited in water, and may be classed as sapropelic, in contradistinction to the humic and spore coals. In the cannel seam of many of the Lancashire districts there can be seen a gradual transition from the humic to the sapropelic condition. In some cases there may be 2 feet or more of cannel, usually in the centre of a basin, gradually thinning away on every side to 2 or 3 inches and away to nothing. Usually in the roof, and sometimes in the cannel, there can be found fossil fish remains, such as teeth, scales, jaws, spines, of a marine character; also one or two species of fresh-water shells. The cannel also in many localities turns imperceptibly into a bastard cannel, and some to oil shale.

The conclusions which are drawn from the above conditions by those who have made close investigations are that local subsidences have occurred, allowing water (fresh or salt) to cover a particular region, and a rotting sort of action has been set up in the vegetable *débris*, causing it to become pulp-like. But for some time afterwards the large trees—such as lepidodendrons—have continued to flourish, allowing the leaf-humus and microspores to accumulate in the bed of the lake, lagoon, or whatever it may have been. Finally, the wet nature of the ground would kill off all the vegetation which formerly occupied the dry land, allowing only aquatic plants to exist. These after a time also died out, as the roof is frequently found to be a mudstone without a trace of fossils, either plant or animal. It has often been suggested that cannel is composed of microspores. The lower part of the cannel beds may have a large number in their composition; but they gradually die away, and their place is taken by the same kind of bodies as are found in the kerosene shales of Scotland, France, Australia, and other places. Bodies of this character have been named *pila*. The only difference between those of the cannel and the kerosene shales is in the size; those of the cannel being much smaller.

The anthracites can be traced microscopically through all the stages from a soft humic coal to that of the very hard varieties found in Russia, America, and Wales. It can be seen that the difference is only through the volatile constituents being eliminated or driven off. The upper seams of coal in the South Wales coalfield show them to be very volatile, while the same seams in other parts of the same coalfield are anthracitical in various degrees. It is evident that the mode of origin is exactly the same as the coals in the English coalfields; for in the highest grades of the anthracites there can be seen the spaces in which the resinous bodies, bands of spores, leaf-tissues, &c., originally occupied, these having had their resinous and other volatile matter driven off by some means. One of the chief causes of the alteration of bituminous coal to anthracite is heat. This can have been generated

in the earth's crust in various ways; one being by the intrusion of sills and dykes of basalt, such as are found in the coalfields of the North of England and Scotland. Several of the Scotch seams are so much altered that they are useless; the same seams in other places being in the various stages between an anthracite and a bituminous coal. Another cause seems to have originated through the lateral pressure of the earth's crust through its contortion. Many of the coal seams in the South Wales, Somerset, and the south-eastern coalfields of England are very much broken up and contorted, and a large part of their bituminous character lost. It is found that when coal is got in this condition it is more or less anthracitical.

Notice will be taken of the various samples of coals on which the above notes are chiefly based, and on examination it will be found that a large amount of alteration has taken place in some of the seams and scarcely any in others. It will also be seen that where the coal is full of cracks and finely broken up and black, it is very nearly an anthracite; and as these conditions become less pronounced, the coal is more volatile and bituminous.

It must not be taken for granted that the thickness of a seam of coal, as found, represents the whole thickness of the vegetable *débris* as originally deposited, for there has been a tremendous amount of vertical compression: First by its accumulation layer on layer, and secondly by the decomposition of the overlying beds of mudstone, shale, and sandstone, one knows how thick such beds are over any given coalfield, the lateral compression being exceedingly slight in comparison to the vertical. Many experiments have been made to estimate the amount of compressed vegetable remains it would take to form coal one foot thick. The general belief is that it would take from 10 to 12 feet of peat-like remains to make one foot of coal, if compressed to the same extent as some of our coal seams appear to have been. But much of this is conjectural, as no true data are available. The comparison depends on the quality and kind of vegetable matter; some being more decomposable than others and more easily reduced to pulp, some plant remains containing more resinous matter than others, which would tend to preserve those remains according to the amount of resinous matter contained therein. Other factors besides should be taken into account—such as the nature of some of the woody matter, portions of stems, branches, &c., being such that their tissues have been beautifully preserved without the least compression, while others have decayed and been flattened out, as shown in the numerous layers of mother of coal found more or less in all seams. Much of this is attributable to the stripping or falling of the cortical layers of the various carboniferous trees, some having had a very thick cortex. Yet another factor is that of the amount of superincumbent cover or strata, before the solidification of the vegetable matter. Some coals are not nearly so much compressed as others. In some the leaf-like and other humus lie layer on layer without much distortion; in others similar humus is so crushed it is scarcely recognizable.

One of the best examples known as to the amount of vegetable matter required to form a given thickness of coal, was found in the upper foot seam of the lower coal measures at Shore, near Littleborough. The upper foot is a seam which contains in many places a large amount of coal balls or nodular concretions, composed of petrified plant remains, in size from that of a pea to some more than 2 feet in diameter. The plant remains have their tissues exceedingly well preserved in a matrix of carbonate of lime; some being quite as perfect as the tissues of a recent plant. The preservation of the plant remains must have taken place before there had been any compression or carbonization, as many of the stems and wood tissues show no signs of either, and are practically perfect. The coal balls in some portions of the seam are so thick that, commercially, the seam is valueless. In several places huge blocks of concretions stand up through the coal and far into the roof, one of which was 5 ft. 9 in. in height, and proportionately wide; the weight being over two tons. The coal around the block was 10 inches thick; the block being slightly larger at its base than at the apex. It can be assumed with little doubt that the mass of petrified plant remains composing the block represented the original thickness of the vegetable *débris*, with perhaps a slight flattening through its own weight, that now is represented by the 10 inches of coal, showing that to form a seam of coal it has, in this particular instance, taken 5 ft. 9 in. of vegetable matter to form a seam 10 inches thick, or nearly 7:1. A polished slab from this block can be seen in the Fossil Plant Gallery at the Natural History Museum, South Kensington.

LEAD ACETATE TEST FOR HYDROGEN SULPHIDE IN GAS.

By R. S. M'Bride and J. D. Edwards.

Technologic Paper No. 41 of the United States Bureau of Standards deals with the subject named above.

The authors state that the effect of the following factors upon results obtained in tests for the detection of hydrogen sulphide in gas by the lead acetate test have been investigated: (1) The paper: Kind; method of preparation, including strength of lead acetate solution used; moisture content when used. (2) The gas: Its humidity, and period and rate of flow. (3) The apparatus: Its form and size, as determining the circulation of gas with respect to the paper. With gas mixtures containing various known amounts of hydrogen sulphide, these several factors were studied one at a time; and the following conclusions were reached.

An operator, by giving consideration to the desirable qualities which are pointed out, can easily select the most suitable and convenient kind of paper after a trial of a number of samples. The convenience, but generally not the accuracy, of the test is affected by the choice. There is little or no difference in the sensitiveness of the paper prepared with lead acetate solution from 2 to 12 per cent. in strength. A 5 per cent. solution is recommended. The treatment of the papers with ammonia or carbon dioxide does not materially change their sensitiveness.

The large effect of the humidity of the gas upon the test results is shown; but it is also noted that the use of moist paper with short test periods (not over three minutes) gives results practically independent of the humidity of the gas. It is impracticable either to dry or to saturate the gas to a constant condition as to humidity, because of the probability of simultaneous change in the hydrogen sulphide content.

The rate of gas flow is shown to have some effect; but increases in rate produce less effect than proportional increases in the time of test. The general practice of making tests at 5 cubic feet per hour is satisfactory. Maintenance of the rate within the limits 4·5 and 5·5 cubic feet per hour is sufficient.

The time of the test is an important factor in determining its sensitivity. The proper basis for selecting the length of the test is treated in connection with the discussion of the quantitative and engineering significance of the test.

The different forms of testing apparatus used may be classified into three groups—circulating, impinging, and penetration; these being distinguished by the manner in which the gas is brought into contact with the paper. The five forms of circulating apparatus tested were: The simple hydrogen sulphide tester, chosen for this work and designated in this paper as the standard apparatus; the Gas Referees apparatus; the Young's sulphur and ammonia test apparatus; the small drying-tower form; and a large Woulfe bottle. Only one form of the impinging type was tested; and a single penetration apparatus devised by the authors was used.

The variation in the test with different forms of apparatus is largely due to the variation in intensity of the gas currents, and their direction in relation to the paper. In the small drying tower, the test paper was suspended close to the rubber stopper bearing the burner; and a much larger proportion of the gas came in contact with the paper than in the other forms of apparatus. Although the Woulfe bottle had a larger capacity than the Referees apparatus, it consistently gave a stronger test than the latter—showing that size alone is not a determining factor. The shape of the apparatus and the location of the paper relative te the inlet and outlet have an important influence.

It has been generally recognized that a test in which the gas impinges on the paper is more sensitive than one in which the gas does not impinge. This is due to the better opportunity for contact of the gas with the reagent on the paper and to the small area within which the lead sulphide is concentrated. A similar increase in sensitiveness is accomplished by causing the gas to be tested to pass through the paper, as is done in the penetration apparatus described. This increase in sensitiveness (due to the impingement of the gas on the paper) seems, however, to have been over-estimated by some.

The important influence of the shape and size of the apparatus upon the result of tests made with it makes clear the necessity of an exact specification of the form and size of the tester. It is, therefore, recommended that the specifications given for the apparatus which is used as the standard in this work be followed exactly in making the tests.

When the test is made under definite conditions, the colouration produced is of quantitative significance, as indicating the amount of hydrogen sulphide present in the gas. The results which are obtained by the procedure recommended as the standard are shown to have the following significance: The test, if of 1 minute duration, will detect about 0·3 to 0·4 grain of hydrogen sulphide per 100 cubic feet of gas. But if the test is of 0·5 minute duration about 0·45 grain of hydrogen sulphide is required to give a test. If extended to three minutes, a gas of about 0·2 grain will give positive results. The Young's apparatus is slightly more sensitive than the standard form; but the Referees apparatus is less sensitive, for it will scarcely detect 0·5 grain of hydrogen sulphide per 100 cubic feet of gas when used with moist paper for three minutes at a rate of 5 cubic feet of gas per hour.

The penetration apparatus is somewhat more sensitive than any of the forms of circulating apparatus. The sensitivity of the apparatus of the impinging type is variable, depending upon the rate of gas flow, distances of jet from paper, &c.; but under the most favourable conditions apparatus of this type is the most sensitive of all. No direct comparison can be made with the work of some of the previous observers; but it is certain that too great a sensitivity has been ascribed to the procedures used by these experimenters.

The commercial significance of the testing procedures recommended is pointed out. It is stated that many tests of similar severity, and some a great deal more severe, have been met regularly in the past—showing that the proposal is certainly not unreasonable. The method recommended for use is quick and convenient and gives reproducible results; and a simple and inexpensive form of apparatus is described which can easily be constructed by inexperienced persons without any sacrifice of the advantages due to exactness of specifications.

WORKS TOPICS.

By "Modus Operandi."

Testing the Practical Value of Coals.

The Presidential Address of Mr. Ward to the Midland Junior Gas Association contains a good deal of interesting matter, and one or two points which may with advantage be discussed in this column.

In dealing with the question of purchasing coal, he states that "before making purchases the probable state of the coke, tar, and liquor markets for the period covered by the contract should be carefully considered, and coals selected which produce the maximum of those particular products for which the highest prices are likely to be obtained." This is an interesting theory, and it is one worthy of discussion; but the writer makes bold to say it is almost invariably overlooked—for certain easily explained causes. Few engineers—consequent on the absence of full-scale testing plant and the practice of using several varieties of coal—could state the yields of gas and products from any individual coal. They can give an approximate idea of the value of a coal, so far as the make and quality of gas per ton and the quality of coke produced are concerned, but that is all. The yield of tar and ammonia is, in the majority of cases, quite obscure, as there are no means in practice of testing such points. Small test-plants, in which a few pounds of coal are carbonized, are, in the writer's opinion, of very little practical use. They enable some general idea to be formed of the value of a gas-making coal; but this is the limit of their usefulness.

The above remarks do not, of course, apply to those engineers who are fortunate enough to have full-size testing plant, from setting to meter, and complete with tar and liquor storage tanks; nor does it apply to those who buy one class of coal only. These would, however, be exceptional cases. There is no doubt that proper means of testing the practical value of a particular coal should lay within the powers of every engineer. But not until such facilities are provided will it be possible for Mr. Ward's ideal to be put into general practice.

Again, in so many cases there is some particularly good reason for buying a certain variety of coals. The proximity of a neighbouring colliery, or special facilities for obtaining cheap rates from some particular district, is often bound to influence their choice. There is, too, the matter of the quality of the coke made from different classes of coal. If a good trade has been built-up on a high-class grade of coke, it is extremely impolitic to endanger the goodwill of one's customers by supplying them with an inferior quality of coke. This is a most important point, as a customer once lost is difficult, and often impossible, to regain.

Vertical versus Horizontal Coke.

The question of the quality of coke brings us to another point mentioned in the address. Mr. Ward states that: "Horizontals almost filled with coal produce much better coke than most of the verticals; the quantity of tar made is more, and of a better quality; the ammonia returns are quite as satisfactory; while no trouble is experienced from naphthalene formation." This statement follows immediately upon a sentence in which the opinion is expressed that the quantity of gas produced per ton of coal by modern horizontals is also as much as, if not more than, is the case with the best of the verticals. Since reading this the writer has been wondering why 150 gas engineers in this country, many of them in very prominent positions, have been so foolish as to expend many thousands of pounds on vertical retorts. Surely Mr. Ward cannot seriously mean what he says! If so, how does he account for the immense progress made by vertical retorts during the past few years? The number of installations alone—many of them repeat orders—disproves such statements.

Coke from Filled Horizontals.

The writer, though a firm advocate of filled horizontals ever since this system was first introduced, would willingly acknowledge that the coke made in the continuous systems of vertical retorts is much superior to that made in any form of horizontal retorts. Filled horizontals produce a large, hard, and light grey coke, and in appearance of an excellent quality. But for actual sale purposes it has many shortcomings. Its best feature is its strength, which enables it to be roughly handled without making an undue proportion of breeze. For the same reason, it can be stored to greater advantage than can coke from light-charged horizontals. Although large, dense, hard, and carbonized to a very low percentage of volatile matter, it is not sufficiently so to enable it to compete with metallurgical or foundry coke. It is still restricted to the old uses; but unfortunately it is in no way so suitable as light-charged horizontal coke for these purposes, though the latter was by no means an ideal article. Being low in volatile content, and being large and dense, it will not burn unless the draught is intense (which is rarely the case) and other conditions are favourable. Its faults are certainly to some extent repaired should it be broken to a small size; but even then it is not to be compared with the coke made in the olden days of 10,000 cubic feet of gas per ton of coal. This coke was smaller, not nearly so hard, much more porous, and contained 4 or 5 per cent. of volatile matter—in other words, "gas." It burnt freely without much draught, and was a very desirable article. In only one respect was it inferior to the coke from filled horizontals, and that was in the matter of friability.

Coke from Continuous Verticals.

The continuous vertical coke has all the advantages of the old type of coke without its one disadvantage—friability. At least this is the writer's opinion, as the result of his inspections of coke at many of the works where vertical installations are in use. It is smaller than the filled horizontal coke. It is quite free from water, and is of a light grey colour. It is fairly hard; but it is very porous—quite honeycombed, in fact—which, together with its freedom from water, is largely responsible for its good qualities. Its content of volatile matter is equally low to that of any horizontal coke; but its porosity, and the consequent readiness with which the draught can percolate through the interstices of the coke, is accountable for its rapid ignition. These features are of great importance, and explain the reason that continuous vertical coke should always sell particularly well, especially in the unlimited domestic market.

It is for these reasons that Mr. Ward's remarks on the question of the superior qualities of the coke from filled horizontals, as compared with that from verticals, are not justifiable.

Liquid Products.

So far as liquid products are concerned, though there is little published evidence, the writer has been informed by a very prominent engineer, who has had some lengthy experience of both systems of carbonizing, that the yield of tar and ammonia from continuous verticals is much in excess of that from filled horizontals. It is, too, incorrect to say the horizontal retort yields tar of better quality. The lower specific gravity of the vertical tar is, in itself, practical proof of its superior quality.

The Importance of the Dip-Pipe and Hydraulic Main.

The remarks of Mr. Ward on dip-pipes are very much to the point. The question of the proper fitting-up of the hydraulic main is a subject which is more closely allied to large makes than is often admitted. There is undoubtedly still great room for improvement in this particular section of the gas-works; and those engineers who are responsible for very large makes can usually trace-back this satisfactory state of affairs to the careful arrangement and supervision of their hydraulic mains and auxiliary plant.

Ammonia Extraction by Washers.

The novel idea of using washers only for extracting the ammonia from the gas is explained in detail, and would seem to be well worthy of consideration in other works. Though by adopting this method considerably more back-pressure is caused, Mr. Ward gives very good reasons for his preference—at any rate, so far as his own works are concerned. His method of working-out the cost of back-pressure in £ *s.* *d.* is quite a new and interesting way of considering the matter. The adoption, moreover, of the Livesey type of washers in place of the usual washer and tower-scrubber or washer-scrubber, should enable small gas-works to avoid the necessity of installing steam-boiler plant.

EVENT AND COMMENT.

[Communicated.]

Corrosion of Fire-Bricks by Salt in Coal.

In a note in the "Journal" for Oct. 13, p. 79, the writer referred to the subject of the corrosion of fire-bricks by salt in coal, and ventured the opinion—which he repeats was borne out by experience—that it seemed to have been fairly definitely established that the corrosion is much more marked with fire-bricks containing a high percentage of alumina than with those containing a high percentage of silica. This view was further substantiated from another source, in a letter from Mr. W. Chaney, the Engineer of the Saltley Gas-Works, Birmingham [see "Journal," Nov. 10, p. 312], who found in his own experience that silica bricks stood much better than bricks high in alumina. A directly opposite view is taken by Mr. W. Colquhoun [see "Journal," Oct. 27, p. 194]; and this gentleman was able to quote, from his own wide experience, instances in which it had been found that an alumina brick stood better. We have here then, two gentlemen, each an expert in his particular line, recording absolutely opposite views on what is undoubtedly a very important question. What is the explanation of the divergence? There are various possibilities. Mr. Chaney suggests that the refractoriness of the material may play an important part in the action of the salt, when combined with the wet coal and time of contact. Individually, one might explain the various possibilities; but it is the combination which one cannot explain. As far as refractoriness itself is concerned, there is not a great deal of difference between a good alumina brick and a silica brick. At any rate, the fusing temperature of both is well above the normal working temperature of a coke-oven. As Mr. Colquhoun suggests, the part played by wet coal is little understood; and it may be there is some difference in the nature of the coal carbonized in the respective cases quoted. The author is not personally aware of any plant in this country where corrosion takes place at which other than wet coal is carbonized. Again, the nature of the brick, apart from its composition, may have something to do with the corrosion. One would expect that (as Mr. Colquhoun states) the material forming the brick should be finely ground, the bricks pressed, and have dense and smooth surfaces.

At the recent meeting of the Society of British Gas Industries,

the Chairman (Mr. J. W. Broadhead), in his address, referred to the subject of the corrosion of coke-oven walls. Mr. Broadhead's views were almost identical with those expressed by Mr. Colquhoun, as also was his explanation of corrosion. But in this case also, the writer would put forward for his consideration those anomalous instances mentioned by Mr. Colquhoun, and also the evidence of Mr. Chaney. He is afraid Mr. Broadhead's suggestion, that magnesite might be used for coke-oven walls, is hardly practicable. This is especially so from the point of view of expense, even if the material were otherwise suitable, which is open to question. The supply of magnesite is somewhat limited, and the present price of magnesite bricks—about £42 a ton—is, to say the least, prohibitive. Mr. Broadhead wisely advises vertical retort builders—especially those building retorts of large capacity—to take the possibility of corrosion into account when guaranteeing the life of the setting.

Carbonization of Coal.

The phenomena attending the carbonization of coal in gas-retorts has been the subject of much scientific research by competent students, and much useful knowledge has been gained thereby. Corresponding attention might very well be paid to the subject of bulk carbonization, as exemplified by modern coke-oven practice. In gas-works, conditions are pretty much the same in all cases. Dry coal is used, and temperatures and working conditions do not vary a great deal. In coke-works, on the other hand, a much greater variety of conditions is to be met with. Various classes of coal are used. Some are dry; others contain from 6 to 12 per cent. of added water. There is also the matter of compressed and uncompressed coal, the time of carbonization, and also the temperature. The majority of these conditions are influenced solely by the nature of the coal being carbonized; the treatment being varied as required, in order to produce the best quality of coke. Thus, for example, it is usual to compress coals containing more than 25 per cent. of volatile matter. In such cases, it is necessary to add water to the coal; and here again the engineer responsible must use his own judgment as to the most suitable proportion to be added. In some cases, 6 per cent. is deemed to be sufficient, while in others even 12 per cent. is added. Naturally, the presence of this extra water in the coal must have some effect on the carbonization of the coal, and one would expect that some difference would be noted either in the coke or else in the bye-products. Continued investigation is not often possible; but there are plants in operation at which the same coal is used both for compressed and uncompressed charges. In such cases useful comparisons might be made. The immediate result of carbonizing wet coal is a noticeable increase in the amount of ammoniacal liquor produced.

Generally one would expect to be able to forecast to some extent the relative difference which might be noticed in carbonizing wet and dry coals. One would imagine that, in general, the part played by the water would be to reduce the average temperature obtaining in the oven throughout the period of carbonization on account of the absorption of some heat by the steam produced by the evaporation of the water. We know that the period of carbonization of wet coal is anything from 20 to 40 per cent. longer than with dry coal. We should expect also that the yield of gas would be higher from dry coal than from wet coal, but that the quality of the latter gas would be better than that of the former, on account of the lower temperature. On the other hand, there is the equally possible view that a kind of "water gas action" might be produced by the action of the escaping steam on the incandescent coke, thereby increasing the volume of the gas. The lower temperature should also have the effect of increasing the yields of tar, ammonia, and benzol, as all these are decomposed by high temperatures. For the same reason, the quantity of coke produced would be rather less than with dry coal.

The above deductions are given for what they are worth, and as a result of careful observation and collected information. Our knowledge of the subject is, to say the least, very deficient, and the importance of the question both commercially and scientifically warrants further investigation.

The Coal-Tar Colour Industry.

In an editorial note in the "Journal" last week the writer was taken to task with regard to his expression of the opinion that great difficulties lie in the way of establishing the coal-tar colour industry in this country. That there are many difficulties is (the author believes) generally admitted; but the magnitude of them naturally depends on the point of view of the observer. He still holds the opinion that in many quarters—including some Chambers of Commerce—the strength of the German colour industry has not been realized. An enormous amount of capital is invested in the industry in Germany; and the commercial leaders of that country are not given to overloading their enterprises with an unnecessarily large amount of capital. He holds therefore that the financial difficulty is by no means a small one. Again, it has taken years to build up the industry in Germany, and it is not likely that, without all the organization of the German firms, we are going to begin where Germany has left off. We shall have to go back a few years, and it will take time before we are in a position to produce as cheaply as Germany. Then when the war is over, it is doubtful if, under present conditions, we could continue to hold the markets against German competition. Tariff protection would, of course, get over this difficulty. The writer would like to draw readers' attention to a paragraph in a previous issue under this heading [see "Journal," Sept. 8], in which the following occurs. "If we are to make the attempt [*i.e.*, to capture the German trade] the effort which will have to be made can, in the writer's opinion, only hope to succeed if it is subsidized by the Government." According to latest information, the Government are prepared to assist; and this being so, considerable difficulties will be eliminated. But even with Government assistance, it will take a considerable time for the establishment of a concern able to entirely replace German products. The Government support therefore must be extended for a long period. America is in practically the same position as this country with regard to dye-stuffs; and inquiry is going on as to the possibility of the development of the colour industry there. It has already been recommended that Government support in the way of protective tariffs is a *sine quâ non* of successful establishment.

NEW STANDARD LIGHT SOURCE.

Tests of an Acetylene Lamp.

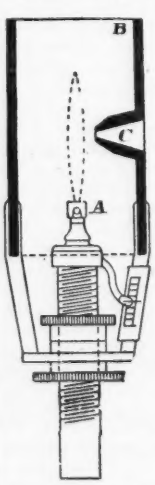
At the last meeting of the American Illuminating Engineering Society, Mr. L. A. Jones read a paper in which he described a new standard light source. The following are some particulars in regard to it.

The author began by reviewing the standard light sources now available for practical use in laboratory and testing work, and then considered the availability of acetylene for the purpose. He pointed out that the acetylene flame has been employed to some extent as a standard, and said that in many ways it is well adapted to such a use. The colour is very white, and requires a filter of only medium density to reduce it to daylight. The unscreened flame is almost an exact match in colour with a tungsten lamp operating at about 1·25 watts per mean horizontal candle power. The spectral energy distribution has been determined very accurately by Stewart and also by Coblentz.

It is a simple matter to prepare acetylene gas of the required purity, and to control and measure the gas pressure. The ordinary type of acetylene burner gives a broad flat flame, which varies appreciably in colour and intensity from the centre to the edges. Such a flame, if so screened that only a small area of the most intense portion of the flame is used as the light source, makes a fairly satisfactory standard; but since the screening diaphragm cannot be very close to the flame, errors due to parallax are likely to arise. The flame is also very sensitive to air currents and to the ventilation conditions of the box or enclosure in which it may be placed to shield it from these currents. A more satisfactory type of burner has been designed by Messrs. Mees and Sheppard, and some data on the constancy of intensity has been published by them. This burner gives a long thin cylindrical flame not sensitive to air currents, and with a very uniform intensity over several millimetres of its length.

The object of the author's investigation was to determine the reliability of such a burner as a light standard. A large number of photometric measurements were made on several burners of this type, over a wide range of operating conditions. The intensity at various points along the flame and the variation of intensity with change of gas pressure were measured; and from the results of these measurements the conditions tending to the minimum variation of intensity were established. Such burners are not reproducible to the precision required for a primary standard, but must be standardized under fixed conditions by comparison on a photometer with some primary or secondary standard source of which the intensity is accurately known.

The accompanying diagram is a cross section of the burner used in the investigation. The tip A is of the Bray air-mixing type, consuming 0·25 cubic foot of gas per hour, giving a cylindrical flame about 3 mm. (0·12 inch) in diameter and 50 mm. (2 inches) in height. The tip is mounted inside a cylindrical metal hood B with a rectangular opening C in one side. From the edges of this opening metal leaves extend inward to within about 2 mm. (0·08 inch) of the flame. The inner edges of these leaves form an aperture through which a short section of the flame is viewed; and as this opening is quite close to the flame, the possibility of parallax errors is reduced to a minimum. The aperture thus formed is approximately 3 mm. high and 10 mm. (0·4 inch) wide. Thus a section of the cylindrical flame about 3 mm. long is all that is actually used as the standard light source. The acetylene was made in a Thorne and Hoddle generator, from which it passed through a purifier containing bleaching powder and potassium chromate, and thence through a regulator which maintained the line pressure constant to within 2 per cent.



The standard lamps used to make the photometric measurements were 50-volt tungsten glow lamps operating at about 1·25 watts per mean hemispherical candle power. They were all standardized at the National

Physical Laboratory; and the values in terms of the international candle were certified to 1 per cent. They were operated on a 60-volt storage battery; the electrical measurements being made with a Wolff potentiometer and a high sensibility galvanometer. The comparison method was used in the measurements; the comparison lamp also being supplied from a storage battery and measured by the potentiometer. The photometric measurements were made on a 12-foot (3·65 m.) bench photometer of the National Physical Laboratory type, fitted with a Lummer-Brodhun contrast photometer head. The readings were taken with both the standard lamp and acetylene burner unscreened; and though there was a slight colour difference, it was not great enough to cause any appreciable error in the settings. Six burners were used, the intensity of the light given being measured with the window at different distances above the top of the burner-tip and at various gas pressures.

In the following table is a typical set of data for burner No. 3; being four complete runs made on different days by two observers. The following symbols are used:

I = Intensity of light in candle power.
P = Pressure of gas in centimetres of water.
D = Distance (in millimetres) between the top of the burner-tip and the middle of the window in the hood.
dI = Maximum deviation of any single determination from the mean.

P = 8 cm.

	D = 16·9	18·5	20·1	21·8	23·4	25·0
Run No. 6.	0·97	1·06	1·09	1·04	0·95	0·74
Run No. 7.	0·89	1·03	1·06	1·04	0·98	0·76
Run No. 8.	0·90	1·01	1·06	1·03	0·96	0·75
Run No. 9.	0·98	1·06	1·05	1·02	0·94	0·75
Mean I.	0·94	1·04	1·06	1·03	0·96	0·75
dI . . . per cent.	5·3	2·9	2·8	1·0	2·1	1·3

P = 9 cm.

	D = 16·9	18·5	20·1	21·8	23·4	25·0
Run No. 6.	0·84	1·03	1·11	1·12	1·08	0·90
Run No. 7.	0·81	0·98	1·10	1·10	1·08	0·96
Run No. 8.	0·85	1·03	1·12	1·12	1·08	0·91
Run No. 9.	0·78	0·94	1·06	1·10	1·09	0·98
Mean I.	0·82	1·00	1·10	1·11	1·08	0·94
dI . . . per cent.	4·9	6·0	3·6	0·9	0·9	4·2

P = 10 cm.

	D = 16·9	18·5	20·1	21·8	23·4	25·0
Run No. 6.	0·72	0·92	1·09	1·13	1·15	1·06
Run No. 7.	0·71	0·92	1·06	1·10	1·13	1·06
Run No. 8.	0·72	0·87	1·04	1·06	1·14	1·03
Run No. 9.	0·71	0·93	1·07	1·15	1·17	1·08
Mean I.	0·72	0·91	1·06	1·11	1·15	1·06
dI . . . per cent.	1·4	4·4	2·8	4·5	0·7	2·8

Average dI = 2·9 per cent.

From two to six complete runs were made on each of the six burners, and a set of curves was plotted for each burner. From these, the best values for distance (D) and pressure (P) were obtained. They are given in the following table, in which the meanings of the symbols used are as follows:

Do = Best value for D (in mm.).
Po = Best value for P (in cm.).
Io = The value of I (in candle power) when D = Do and P = Po.
A = Percentage change in Io due to a change in Po of 2 per cent.
H = Height in mm. of window in hood of burner.
Io/H = Intensity in candle power per millimetre of flame.
dI = Percentage deviation of Io/H from the mean of all burners.

Burner.	Do.	Po.	Io.	A.	H.	Io/H.	dI.
No. 1	17·6	9	0·98	0·05	2·95	0·332	4·8
No. 2	19·8	9	1·28	0·13	3·50	0·366	4·9
No. 3	20·1	9	1·10	0·18	3·20	0·344	1·2
No. 4	18·3	9	1·24	0·19	3·30	0·376	7·5
No. 5	18·1	9	1·09	0·12	3·23	0·338	3·0
No. 6	17·8	9	1·04	0·19	3·05	0·341	2·1
No. 2*	18·1	9	1·18	0·20	3·50	0·337	3·3
No. 2†	17·9	9	1·23	0·15	3·50	0·351	0·9
Mean				0·15	—	0·348	3·46

* Tip No. 5. † Tip No. 6.

The author says the results of the measurements show that such a burner as that described, when properly operated, is sufficiently accurate and reliable for all ordinary purposes. It is not a reproducible standard, but, when accurately adjusted and standardized, it makes a very serviceable secondary working standard—giving a good quality of whiteness and constant intensity, with little attention on the part of the operator. These burners have been in daily use in the laboratory during the past year, and have proved very satisfactory indeed. Though designed primarily for use in photographic sensiometry, they have been found very useful as working standards in other testing work, where a light source of constant intensity and of known spectral quality is required. The advantages of this standard source may be summed up as follows: Constant intensity, light of good quality, accurately known spectral energy distribution, simplicity of apparatus required for operation, and small amount of attention necessary to keep in adjustment.

Coal-Gas Residuals.—We have received from the Hill Publishing Company, Limited, of Bouverie Street, E.C., "Coal-Gas Residuals," by Frederick H. Wagner, M.E. The price of the book is 8s. 4d. net. A review of the contents of it will be given in an early issue.

OXY-ACETYLENE WELDING.

At a recent conference of shipbuilders and engineers, a paper was submitted by Professor A. Campion and Mr. W. C. Grey on the results of tensile and impact tests of oxy-acetylene welds. The following abstract of their communication appeared in the "American Gaslight Journal."

The authors remarked that, under working conditions, the material was usually subjected to repeated shocks; and they had, in addition to static tests, compared the effects of repeated impact on welded and unwelded metal. The material used was mild steel, containing about 0·25 per cent. of carbon. For the first series, bars $\frac{3}{4}$-inch in diameter were turned-down for a length of $1\frac{1}{2}$ inches at the weld to $\frac{5}{8}$ inch in diameter; the elongation being taken on a 1-inch length. Contraction of area was not recorded, because most of the fractures were too ragged to allow of measurement. The results indicated that an average weld had about four-fifths of the strength of unwelded steel, while the ductility is only about one-fifth. There was no great variation in the maximum tensile strength, but ductility varied widely from the average; for the lowest strength of welded metal was about 80 per cent. of that of the original steel, and the lowest elongation was only 9 per cent. Ductility was increased by hammering; but the strength was lowered. Reheating after hammering improved both the ductility and the maximum stress. Reheating at the same temperature without hammering caused a comparatively large rise in ductility and a small rise in strength. Quenching in water and reheating brought the strength up almost to that of the unwelded steel, but diminished the elongation.

For the impact tests, bars $6\frac{1}{4}$ inches long and $\frac{1}{2}$ inch in diameter were notched in the centre of the welded part to a diameter of 0·4 inch. The results showed great variation, and suggested that an average weld would resist only half as much fatigue as unwelded metal. Hammering improves the weld in this respect; but the metal should be reheated at a full red heat—800° C. (1472° Fahr.)—to avoid production of strains or brittleness. Reheating or annealing without hammering has but little effect. The treatment which produced the best results in the tensile tests gave the worst in the impact tests.

Further experiments with the bars notched at the edge of the weld instead of at the centre were made to ascertain the influence on the whole weld of the overheated zone produced during welding, and the results varied still more than those given by centrally notched bars; but while hammering specimens of the latter gave 84·4 per cent. of the original strength, the hammered side-notched bars gave only 57·7 per cent. Impact tests on plates of different thickness showed conclusively that the reliability of the weld and the strength decreased as the thickness increased.

The authors conclude that very serious responsibility is incurred by using autogenous welding in parts which may be subjected to any considerable strain.

Intensified Gas Lighting for Colliery Premises.—In a paper submitted at a recent meeting of the Lancashire Branch of the National Association of Colliery Managers, Mr. F. Whittaker, of Accrington, described an installation of intensified gas lighting in the colliery with which he is connected. When considering the practicability of gas lighting, he put himself in communication with the James Keith and Blackman Company, and on their advice plant was put in. Eight lights were fixed in the bottom; and after fifteen months' experience Mr. Whittaker said he regretted that he had not put them in years before. He obtained the result stated by the makers—viz., 60-candle power per hour per cubic foot of gas consumed. On the surface there are thirteen 60-candle and two 150-candle fittings. The cost of the installation was £62 4s., or £2 14s. per lamp; and the actual cost of lighting per annum is £19 5s. Mr. Whittaker could not give the cost of gas (at 2s. 10d. per 1000 cubic feet) as compared with electricity; but he expressed the opinion that, where gas is available, no other method of lighting can equal it for collieries.

Coal-Tar Industry in England.—Dr. Percy F. Frankland, F.R.S., Professor of Chemistry in the University of Birmingham, was recently asked whether there would be any difficulty in obtaining an adequate supply of the coal tar required in this country; and, in reply, he stated that there is an abundance of the raw material here. This country used, he said, to be the greatest producer of coal tar in the world. We distilled it here and sent the product to the Germans for them to obtain the dyes, which they sold back to us. Germany was now, however, practically independent of us, owing largely to the great attention given there to the recovery of bye-products from coke-ovens. Our own cokers had gone nothing like so far in this direction; but their practice was being rapidly improved. The late Sir William Perkin, the founder of the coal-tar colour industry, a number of years ago made the calculation that if the 9 million tons of coal which were then annually used in the manufacture of coal gas were "rationally," treated, there would be obtained besides the gas the following residuals: Dyestuffs, valued at £3,350,000 annually; ammonium sulphate, valued at £1,960,000 annually; creosote oil, £208,000; crude carbolic acid, £200,000; other (unnamed) residuals, £365,000; and coke, £2,400,000—showing a total amount of £8,503,000 per annum. These figures are at the present time unmistakably attractive to coke-oven owners and ironmasters.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Co-Operation and Co-Ordination.

SIR,—It is a long, long time since I sent a letter to the "JOURNAL;" but, on looking through my papers after an absence in the country, I am struck by three items, which seem to me to be worth while emphasizing.

The first is in the handy brochure on "The Purification of Gas by Heat," for which I am indebted to Mr. Charles Carpenter, D.Sc. At p. 47 he says:

> "I think we engineers have in the past—I make confession for myself, at any rate—been too wholly governed by the requirements within our works. I think we require to give a much more open ear in the future than we have done in the past to what those who have to sell our gas have to tell us of what the users have to say about it."

Coming from the source which this does, and remembering that some time ago the Institution of Gas Engineers considered the question of enlarging the field of its membership, I submit that this "confession" is not without significance.

The second item is Mr. J. Ferguson Bell's opportune letter and enclosure on "The Capture of German Trade," which appeared in last week's "JOURNAL." He also said: "We must revise our methods;" and the extract from the "Chemical Trade Journal" set out that "the business side and the 'brains' side must be brought into closer contact in England."

The third item is the concluding sentence of Mr. J. W. Broadhead's excellent address as Chairman of the Society of British Gas Industries. It reads:

> "As a Society, we pin our faith and reliance upon a combination of science, technique, and commercial sense, as being the best possible for the improvement and betterment of that branch of public service to which we are all attached."

These three separate instances appear to me to be wise and appropriate calls at the present time to the importance of co-operation, co-ordination, and true co-partnership.

Temple, E.C., Nov. 22, 1914. C. E. BRACKENBURY.

The "S.B.G.I." and Forthcoming Exhibitions.

SIR,—I see on p. 296 of the Nov. 10 issue of the "JOURNAL," a reference to the two exhibitions conducted by this Company, stating that "the Society of British Gas Industries has refused an application to officially support these two exhibitions." As you can readily understand, a statement of this description at a public meeting is calculated to do a considerable amount of harm to these exhibitions; and I would, therefore, ask you to be good enough to state in your next issue that this Company has never—either this year or in any previous year—asked the Society for their support.

Palmerston House, E.C., Nov. 16, 1914.

H. S. ROGERS,
Manager, Trades' Markets and Exhibitions, Limited.

Gas Supply Regulations in Illinois.

SIR,—In your Oct. 20 issue there is an editorial on "Elaborate Gas-Supply Regulations." Please give this reply in the "Correspondence" columns.

Your method of stating that the Commission has "lately" formulated a set of rules would lead readers to believe that this State has long enjoyed the benefit of utility regulation, but has only just formulated a new set of gas rules. The Act of 1913 created that body; and it was only on Aug. 3 that a gas engineer was appointed. If the Commissioners or the Chief Engineer had known your opinion of me, they might have made a better choice. My chief reason for writing is to have you correct (by publishing the facts) the impression that might be created by your statement which reads: "Therefore, it was not within our knowledge that his experience had qualified him to take part in legislative work governing the relationships between suppliers and consumers, and the apparatus through which there is trading between the one and the other." That is an unwarranted attack because, as a matter of fact, you must candidly admit you have not the slightest knowledge of my work during the last eight years. It is, however, well within your knowledge that for more than sixteen years I have written articles on almost every conceivable angle of the gas business—not only for your "JOURNAL," but for up-to-date magazines and journals published in America and in Europe.

You state that we have prepared rules which guard the interests of the consumers. Of course, we have. Is not that what the Commission was formed to do? It is not true that we have left almost out of sight the interests of the gas suppliers; and you know it, or else you are lacking in judgment.

Let me ask you this question: Where is the cheapest and best gas service furnished? Is it in England? Naturally, this leads us to the question: What country is most subject to stringent regulation in the manufacture and distribution of gas? Answer me that, and I will give you a few more questions that you will find easy to answer, but not so easy to explain.

No fair-minded man will back you up in your statement that the rules indicate your belief that suppliers of gas are "as a rule thieves or rogues." There is no such implication. You claim "The greatest advances in this country in rendering good gas service to the community have been in directions in which there is little or no regulation." That is a plain asseveration not substantiated by facts. Great Britain has had stringent regulations, adequately enforced for half-a-century; and you surely do not admit or boast that your gas supply is deficient in service or quality!

What is the elaborate equipment you have in mind, such as will make stand on end the hairs of the heads of gas managers? I will venture the assertion that there is not a gas-works of any size in Great Britain that has not in use at the present time apparatus and methods closely in line with those we prescribe in the new rules. If you know it all, why do you not try and teach us (and all other Commissions, the Bureau of Standards, and the London Referees) just wherein we err on the side of stringency in the rules? Could any efficiently operated gas-works possibly get along with less complete tests? If so, in what particular?

The testing of consumers' meters is substantially the present practice in Illinois; and we merely put on record the rule followed by most gas companies. Surely you give consumers some credit for common honesty, and do not imply that they might ask for repeated tests simply for the sake of causing expense to the utility company. Your statement about the Commission looking after its own interest is really too absurd. Surely you do not believe we hope to make a profit in testing meters.

You put a wrong construction on the clause referring to charge if the amount of error is not substantial. If a utility considers the sum is substantial, it will naturally render a bill. If it does not, it surely will not consider it important enough to insist on the collection. If the amount is substantial, but is directly the result of neglect on the part of the utility company, why should the consumer be made to pay? If a utility has not the common sense to test a meter as soon as the monthly bills show it has a tendency to run slow, the utility ought to suffer the loss caused by its negligence.

The method outlined for placing the meter readings on the bills is common practice out here; and we simply desired to make it uniform. You are quoting from the general service rules which apply to both gas and electric utilities; and if you had any knowledge of the electric business, and how it is operated over here in combination with the gas business, you would have a better right to criticize the rule.

You probably never saw an American gas bill. So you are not in a position to know that the new rules are simply based on the best practice out here, and were printed in an effort to make such bill-heads uniform.

You misread the rule which makes it compulsory upon utilities to file rates when it is proposed to charge a higher rate for gas sold through a prepayment meter than for gas computed from the standard schedule on file with the Commission. Do you know that this clause was put in for the benefit of gas companies, because we found many of them had actually been charging at a lower rate for gas sold through a prepayment meter than through credit meters? You say: "All the provisions are not bad," and I would thank you for these few kind words, did I not remember the trite Shakesperian remark about faint praise.

The testing of meters every five years was not settled upon by a mere guess, but from an actual investigation. Before you criticize a clause like this, you should get a few facts.

Speaking about what you call the "stability of the calorific value of a gas," I venture the assertion that you do not know anything about gas as made and used in America. What do you think happens when a company distributes a mixture of coke-oven gas, retort gas, water gas, and benzol gas, and varies the proportions from day to day? If such a gas is sent through pipes that are 30 inches below the surface, and the temperature of the atmosphere reaches (say) 30° below zero (62° of frost), or at other times goes up to 110° in the shade, can it be truthfully said that any kind of gas is stable as between the plant and one mile therefrom? Do you know that some companies over here have high-pressure distribution exclusively, in certain districts; and do you believe, in that case, gas samples at the works would show anywhere near as high calorific value as on a sample taken from a point at least one mile from the place of manufacture? This is a common rule out here, and has always been accepted as fair and reasonable.

Speaking of these tests. You are getting them confused with some methods which are in vogue in Great Britain, where a local inspector may be appointed by the borough and have the honour to be present in the interests of the local councillors when tests are made. Do you not get the big, broad view of this regulation question, in that a State Commission will take the gas companies out of the hands of local politicians and the usual army of grafting followers who are at hand on all occasions? The United States Government cannot make rules for the separate States in the way Parliament does in England. There must be some governing body in each sovereign State; and is it not better to have a real Commission—something like the permanent staff of the English Government—rather than be subject to the whims of a few local and everchanging politicians? Do you know that there is a company here which from one plant (by high-pressure lines) supplies nearly thirty towns or cities, all of which do or might insist on different kinds of gas service? I know of another case where gas from one plant is supplied to seven distinct towns where the franchise requirements are distinctly different from one another.

If you think 2 inches minimum pressure is too high, you ought to come over here for a while and get caught-up with conditions. You state: "There is something rather stupid in the clause referring to interruption of supply." Would it not be fairer to state that this is a general rule which applies to gas and electric utilities, and to add that you really do not know the slightest thing about the electric industry in the United States?

In the peroration you suggest that the work of preparation of the rules should have been entrusted to a number of conscientious gas managers. Would it greatly surprise you to know that two days ago the Illinois Gas Association sent a letter to all its members, in which it recounted the fact that, previous to the promulgation of the rules, every gas and electric company in the State had been invited to send representatives to confer with the Commission? It was put on record that the Public Relations Committee of the Association, through its representatives, had a conference with the Chief Engineer, Mr. R. M. Feustel (one of the cleverest Consulting Engineers in the States), and subsequently were invited to attend, and did in fact attend, a hearing

by the Commission called to consider a tentative set of rules. At the hearing (at which all the interested companies had representatives), there were present members of city governing bodies in the State; and as a result everybody interested had ample opportunity to state his views. A transcript of the testimony was made, and representatives were told they could submit written testimony at a later date, if they desired to do so. Many followed this suggestion, and an enormous amount of useful data was collected. Every bit of it was carefully tabulated, and not one atom of evidence was passed over. What is the result? There has not been one single complaint about the rules, except through your editorial columns. Companies by the score, as well as the Illinois Gas Association, have written to praise the work of the Commission; and, in a public letter, the Illinois Gas Association has, as a body, thanked the Commission and its Chief Engineer for the courteous and splendid treatment received.

Before you again criticize the work of Commissions and tell American gas companies what you think about the regulations they are subject to, would it not be better to read the remarks of intelligent gas men—for instance, those uttered by President W. H. Gartley at the recent Gas Institute meeting?

A. S. B. LITTLE,
State Public Utilities Commission of Illinois.
Springfield, U.S.A., Nov. 4, 1914.

[In the City one day, we saw a young fellow narrowly escape being run over by a hansom cab. He mildly protested against the carelessness of the driver. Jehu retorted that his near victim was a foul-mouthed something or other, and accompanied this amiable expression of opinion with a torrent of invective that left nothing that could have been desired by anybody in regard to its pungency and comprehensiveness. Recently we ventured to criticize some of the regulations applying to gas companies issued by the Illinois Public Utilities Commission; and, in the opening lines, the not unfriendly remark was made that the writer of the foregoing letter "has in his time played many parts in the gas industry, but mostly in connection with gas constructional work and manufacturing processes." That is a statement of fact. We went on to observe: "Therefore, it was not within our knowledge that his experience had qualified him to take part in legislative work governing the relationships between suppliers and consumers, and the apparatus through which there is trading between the one and the other." That, too, is a statement of fact. We repeat "it was not within our knowledge." The result of the mild remarks is that Mr. Little has let loose upon us a torrent of abuse which for pungency and comprehensiveness, as in the case of the Jehu, also leaves nothing to be desired. We have no space for hysterical and devious writing of the kind; and so we have deleted much of it from the still long letter, and allowed our correspondent to have his say on the other points to which he takes exception. But in order that the wide selection of expressions he employed in the deleted parts may not be altogether lost to those interested, let us say that they include such terms as "captious criticism," "ignorant and malicious," "scurrilous personal attack," "contemptible spirit," "penny-a-liner," and "inanity." And all because of the statement that our knowledge did not comprehend the qualifications of Mr. Little as a legislator on the gas-trading side of the industry! A public official should not be so peevish; and he should be above indulging in such a foolish display of wrath as our correspondent made in his letter. We cannot admit that we have not the "slightest" knowledge of the work that he has been engaged upon during the last eight years; as the printed literature received from him has shown that he has taken part in various manufacturing and works' requisites supply businesses identified with the gas industry. Mr. Little appears to have been very successful, in his excitement, in misconstruing our words. We did not suggest that the Illinois Commission regarded gas suppliers as thieves and rogues; what we did submit was that regulations for their conduct need not be framed in such a stringent manner as though they were thieves and rogues. We should not like to answer the passionately worded questions in the fourth paragraph of the letter. To do so, would place us in rather an invidious position with our American friends. Mr. Little asks us to substantiate our "plain asseveration" that the "greatest advances in this country in rendering good service to the community have been in directions in which there is little or no regulation." Three or four illustrations must suffice. One is, since the release from the sulphur restrictions, the development and application of purification processes, which have resulted in gas of higher purity being distributed; another is the voluntary adoption of carbonizing plant and proportions of water gas which have given much greater regularity to the composition of the supply; further, higher and more uniform pressures, though 8-10ths minimum pressure has been the statutory regulation hitherto; and the thoroughly organized service to gas consumers in connection with gas appliances on the part of many undertakings without any obligation being imposed by Parliament. The assertion that Great Britain has had "stringent regulations *adequately* enforced for half-a-century" indicates that our critic is not aware of the character of the "adequate" enforcement in the case of municipal gas concerns. Yet we do not hear more complaints from the consumers in municipal supply districts than in company districts. Why? Because gas engineers know the value of good service, and do not need such a fearful amount of statutory control. The question and the statements in the sixth paragraph are the clearest possible evidence that Mr. Little does not know the character of the testing equipments of the small and many medium-sized British gas-works. He seems to have overlooked the fact that in this relation we spoke of gas undertakings of "moderate" proportions, which numerically, though not in business magnitude, are the greater in this country. The succeeding paragraphs are mostly explanatory, but nothing is said in them which in the least degree alters our opinion that the conditions expose gas undertakings to the whims and fancies of consumers in regard to the frequency of meter-testing. "Whims and fancies" have nothing to do with "common honesty;" but the past history of gas supply in this country, and a personal experience as long as, if not longer than, the whole of Mr. Little's life, satisfy us that "whims and fancies" are of luxuriant growth among both gas and electricity users. We criticized, too, the regulation that enacts that testing of meters shall take place every five years. That is a labour and an expense that should not be called for. Our irritable critic says: "The five years was not settled upon by a mere guess, but from an actual investigation," which is a reflection upon the capacity of American meter-makers to produce, and of gas undertakings to purchase, meters which are reliable for a longer period than five years. We do not know of a single gas undertaking in this country—not even the most progressive, if there is one superior in this respect to all others—that has all its meters tested so frequently as once in five years, and, moreover, supplemented by the right of consumers to have meters tested for accuracy once in six months, according to the Illinois decree. Coming to calorific power, Mr. Little asks: "What do you think happens when a company distributes a mixture of coke-oven gas, retort gas, water gas, and benzol gas, and varies the proportion from day to day?" We should think it very bad practice, in the interests of the gas consumer, and the constant efficiency of his appliances, on account of the change in the composition and density of the gas, and the variable air regulation necessitated by the practice. In regard to condensation, the composition of the gas largely controls the loss of constituents under any circumstances facilitating it, and the composition also controls the effect of the loss upon illuminating power and calorific value. This being so, Mr. Little's question is a terribly bald one; and we hazard the opinion that, as it stands, he could not give a rational answer to it. With given qualities of coke-oven gas, retort gas, and water gas, they would act as quite respectable carriers of the benzol gas; under other circumstances, they would not. Then no one could answer the question in relation to the extremes of temperature referred to—the factors requisite for even an approximate reply are absent from the letter. The effects are not so great as Mr. Little appears to imagine, seeing that atmospheric temperature is not that obtaining under 2½ feet of solid roadway. Upon the character of the road surface and subsoil depend the depth, for example, to which frost will penetrate. In our issue for Feb. 3, "H. N. W.," in a letter referring to this point, said that in Montreal and Quebec he had found frost penetrate between 5 and 6 feet; and he adds: "Regarding frozen pipes, this trouble only occurs in mains, when of too small a diameter; and, if 4-inch be the smallest main laid, then, with proper attention paid to fall, there will not be any frost trouble. As regards services, 1¼-inch is the smallest we run to-day, and again, if the fall be carefully watched, there is only a slight frost danger. In fact, nearly all our frost troubles are due to bad workmanship and small pipes of past days." If the effects were so great as our critic apparently thinks, it would be very difficult to comply faithfully at all times with the regulations. So confusion reigns in the letter; and we get a bit more of it in the second of the following questions. Mr. Little asks: "Do you know that some companies over here have high-pressure distribution exclusively in certain districts? The answer is "Yes." And "do you believe, in that case, gas samples at the works would show *anywhere near as high calorific value as on a sample taken from a point at least one mile from the place of manufacture?*" The answer is "We do." Mr. Little's question supposes an increase of calorific value during the travel of the gas a mile from the works! All investigations show that gas at low or high pressure loses less in calorific value than in illuminating power in its journey through the canalization; and this has been a strong point in parliamentary discussions here over lower illuminating power standards and tests, and more recently over the question of relief from the illuminating power standard and test and the setting-up of a calorific value standard and test. We think Mr. Little should have obtained rather more intimacy with technical facts bearing upon this question before launching out as he has done, and, in obvious moments of uncalled-for rage, applying to us and our previous article terms which would find a better fitting place elsewhere.—ED. J.G.L.]

Leeds and the Doncaster Water Supply.—At the last meeting of the Doncaster Rural Council, a letter was read which had been received from the Town Clerk of Leeds, stating that the Corporation regretted that, owing to the delay of the Doncaster authority in coming to a decision, the Leeds Water Department would be unable to proceed further during the next session of Parliament in the matter of a supply of water to the Doncaster district.

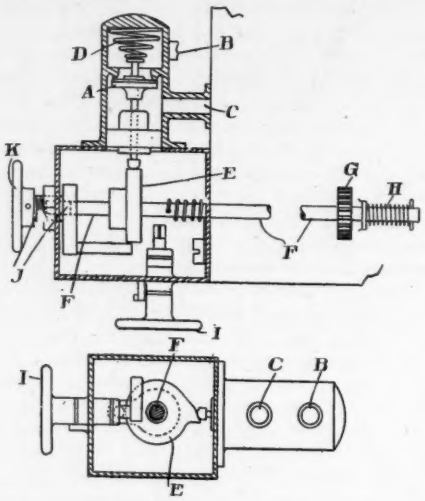
REGISTER OF PATENTS.

Stop Mechanism for Gas-Meters.

JAMES MILNE AND SON, LIMITED, and FOX, T., of Edinburgh.

No. 23,414; Oct. 16, 1913.

This invention relates to mechanism for controlling the supply of gas to a meter—an improvement on stop mechanism heretofore proposed consisting of a gear-wheel having an external knob or handle whereby it may be moved axially in such manner as to put the stop mechanism into or out of gear with the recording mechanism.



Fox's (James Milne and Son) Gas-Meter Stop Mechanism.

The illustration shows a plan of the device (the casing being shown in section) and a vertical section.

The gas passes to the meter by means of the passage B, valve A, and passage C; the valve which controls the supply of gas to the meter being normally held in the open position by a spring D, and is adapted to be closed when required by a cam E, mounted on a rotary spindle F fitted with a toothed wheel G and capable of being moved axially by a spring H in such a manner as to bring the cam E into engagement with the spindle of the valve, while the wheel G is brought into mesh with a second wheel (not shown) in permanent gear with the counting mechanism of the meter. For putting the stop mechanism out of gear, a handle or knob I (provided with a cam-piece or wiper) is mounted in bearings in such manner that the handle may be readily turned to bring the cam-piece into engagement with the cam and to move it (with the spindle and wheel G thereon) in an axial direction, thereby putting the stop mechanism out of gear and permitting the meter to operate continuously until such time as the handle has been turned backwards to permit of the mechanism being moved into gear under the influence of the spring H. The handle is preferably provided with a projection, and stop-pieces are provided on the casing for limiting the rotary movement.

For adjusting the mechanism so as to give the required supply of gas before automatically closing the supply valve A, the spindle F is provided with a collar or sleeve J having an adjusting knob K and a locking nut, and is provided with a pin or projection capable of engaging the cam E on the spindle and of turning it, with the spindle, so as to set the mechanism to give the required gas supply before automatically closing the supply valve; the knob being preferably graduated and having fitted in connection with it a fixed pointer. The adjusting knob may, of course, be arranged inside the casing to prevent any unauthorized person tampering with it after having been once set to give the required volume of gas.

Electric Ignition of Gas-Burners.

PLUMSTEAD, E., of Bow Road, E.

No. 28,499; Dec. 10, 1913. Re-dated Jan. 26, 1914.

This is a modification of the proposal to ignite gas-burners by means of electric sparks passing between terminals over gaps in a battery circuit when the current is automatically switched on by the movement of the gas-cock to admit gas to the burner. It is an improvement on patent No. 14,162 of 1907 and No. 13,141 of 1913.

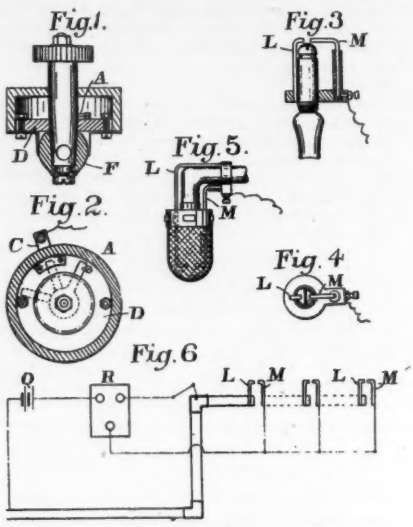
Fig. 1 is a side view (partly sectional) of the combined gas-cock and electric switch. Fig. 2 is an end view of same. Fig. 3 is a side view of a pair of sparking terminals mounted on a batswing burner. Fig. 4 is a plan of same. Fig. 5 is a side view of sparking terminals mounted within an inverted incandescent mantle. Fig. 6 shows diagrammatically how the invention is applied to a number of burners.

The invention comprises an electric switch, formed by an arm A mounted radially on the plug of the gas-cock, and a contact piece C mounted on an insulating plate D, forming one of the flat sides of a cylindrical case secured to the gas-pipe F by a pair of brackets.

In the single burner a sparking gap is left between terminal pieces L M (made of non-corrodible material) mounted in an insulating collar or holder, and forming part of an electric circuit. One terminal is in close contact with the burner, while the other is insulated from it, and is in electric connection with one pole of a battery or accumulator. The switch is so arranged that contact takes place, and the current is turned on, when the gas-cock is nearly in midway position with the gas partially on, and can be switched off by turning the cock sufficiently in either direction without turning off the gas. Thus the current need not be continued after the burners are alight.

For an incandescent mantle, the terminal pieces or wires L and M may be concealed within the mantle, as in fig. 5.

For a multiple arrangement (as fig. 6), the terminals M are all electrically connected with one pole of the battery Q; and the circuit is



Plumstead's Gas-Burner Igniter.

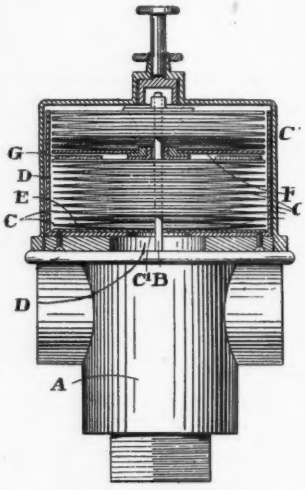
completed through the other terminals L, which are in contact with the gas-pipe. A set of intensity coils R forms part of the circuit. An alternative arrangement would be to insulate all the sparking terminals from the gas-pipe except the last, and cause the current to pass in series from the terminal M of one pair to the terminal L of the next pair, and so on till the circuit is complete.

Gas-Governors.

M'LACHLAN, R. W., of Enfield.

No. 24,466; Oct. 28, 1913.

This invention relates to governors of the type wherein bellows formed from metal or other plates are employed to control the valve which regulates the passage of the gas through the governor. The proposal is to combine with a series of readily expansible bellows-sections a series of upper sections made of stiffer material than the lower; the upper series being weighted at or near its bottom section (conveniently by a weight suspended from a boss carried on the under side of the bottom section) for the purpose of giving the desired steadiness with higher pressures.



M'Lachlan's Gas-Governor.

As here shown, the governor comprises a T-piece A, within which is a valve (not shown) which controls the passage of the gas from inlet to outlet. This valve is carried by the spindle B, which passes freely through a number of bellows-sections divided into two series C C¹. The bellows are mounted in a cup-shaped receptacle D, having a cap placed over it, screwed to the base-plate. No gas can pass to the outside of the bellows, as the bottom section is sealed to the bottom of D, through it being soldered to a plate E, which, in turn, is made gas-tight with the bottom of D. The expansion and contraction of the bellows displaces the air in the chamber formed by D and its cover; a small orifice being provided to allow the air to escape and re-enter as required. This displacement of the air has a dash-pot effect, which assists in steadying the governor; but "it is found that when all the sections are made of material which is sufficiently thin and soft to permit the sections to easily expand, they become unsteady for high pressures and vibrate when sudden changes in pressure take place, so that either through the proper air-cushioning effect not taking place or some other cause, the valve is not quickly and properly operated to maintain an even pressure in the pipes connected with the inlet and outlet." It is found, however, that if the upper sections are made of thicker material (as shown) and stiffer (so that they cannot vibrate), and weight is added at the bottom of the sections, the governor becomes steady in operation.

There are five stiff sections shown, and to the bottom one a plate F is secured, which, in turn, carries a brass collet soldered to it. This collet is screw-threaded in its interior and receives a screw-threaded boss soldered to another plate G, on which weights may be mounted.

The plate G, in its turn, is soldered on its under-side to the top section of the series C; and thus all the sections of the two series are connected—a gas-way being provided through them all by means of the central orifice in the plates of each section, so that the gas can enter all the sections and expand them or allow them to collapse, or partially collapse, as the pressure varies.

Gas Flashing Apparatus.

JACKSON, T., of New Cross, S.E., and RAMSAY, A., of Folkestone.

No. 23,665; Oct. 18, 1913.

This invention relates to the provision of means in the gas-control valve of gas flashing apparatus whereby the periodicity of the flash can be varied within certain limits. It is essentially an improvement of patent No. 29,977 of 1910.

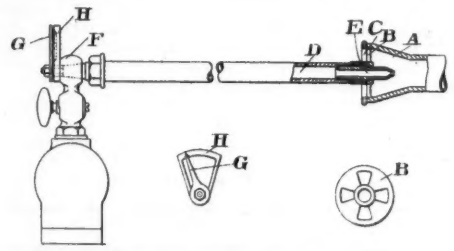
Means are provided in connection with the valve there described by which the tilting of it can take place at any angular position of the valve-box on either side of the vertical line passing through the axis of movement. This may be effected by mounting the part of the valve which co-acts with the valve-seat so as to be adjustable to the body of the valve, and thus come into the valve-seat sooner or later as may be required. Or the valve-seat may be made adjustable in the valve-box, so that it may be raised or lowered relative to the valve. Or, equivalently, the valve may be in two parts, hinged together, preferably at or near the axis of its tilting movement, so that the valve surfaces may be adjusted at a higher or a lower level relative to a horizontal line passing through the axis of movement.

Gas-Burners.

LORD, J., and RUSSELL, W. A., of Manchester.

No. 29,114; Dec. 17, 1913.

This invention has for its object to provide improved means for regulating the air supply to gas-burners so that the regulation can be effected at a distance away without the employment of extended burner barrels or mixing-tubes, "which tend to retard the flow of the gas and air mixture."



Lord and Russell's Regulator Gas-Burner.

The air regulator is in the end of the ordinary burner barrel or mixing-tube A. It comprises two slotted or gapped plates, one of which B is fixed in, or formed integrally with, the tube; while the other C is adapted to be rotated to bring the gaps or slots out of, or into coincidence with, the corresponding gaps in the fixed plate. The movable plate is mounted upon the gas-tube D, which has a nozzle-like end E supported in a central aperture in the fixed plate. The tube E is supported adjacent to its extreme end by a fitting F, from which it receives its gas supply. The end of the gas-tube may be of tapered or plug form or receive a part of such form (as shown), so as to make a gas-tight joint with the fitting by which it is supported and through which it projects. Its extreme end receives an indicator finger G, which moves over a dial plate H upon the fitting, so as to show the amount of opening of the air-regulating gaps.

This arrangement is said to be particularly advantageous for use where the burner is in a position difficult of access—such as under a furnace—as the air regulation can be effected from any convenient point away from the burner.

Fire-Grates for Gas-Producer Furnaces.

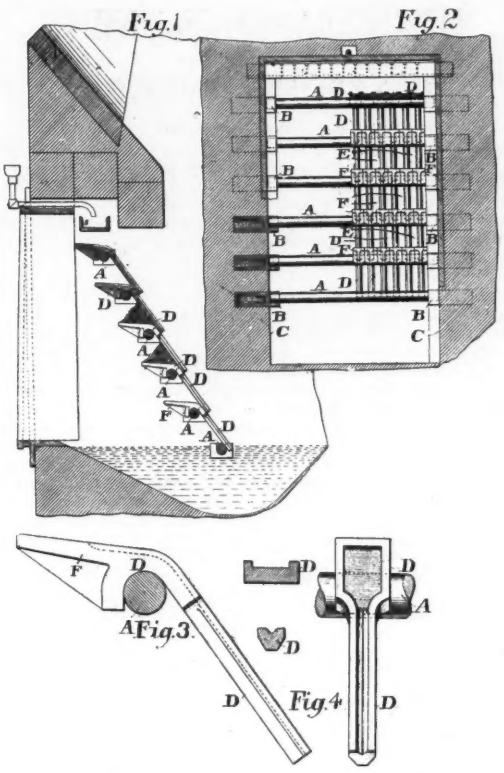
GIBBONS, W. P. and M'EWEN, C. J. (GIBBONS BROS, LIMITED), of Dudley.

No. 12,582; May 22, 1914.

This invention has reference to the construction of the bars forming the producer grate "whereby any possibility of a large quantity of fire falling down into the water bosh, and causing a sudden formation of steam and hot water and scalding the workmen is obviated." The grate bars are so constructed and arranged that any one can readily be removed for clinkering, and replaced, without disturbing the fire or materially disturbing any of the other bars; also when it is desired to clear the furnace for repairs, the whole of the bars can be removed and replaced without disturbing the brickwork. Moreover, any part of the grate service can be banked-up with ashes to reduce the quantity of air passing through the grate into the fire.

Fig. 1 is a sectional side elevation of the gas-producer furnace fire-grate. Fig. 2 is a front elevation (partly in section) with some of the hanger bars removed. Fig. 3 is a side elevation of one of the hanger bars (on an enlarged scale) showing also one of the horizontal bars in cross section. Fig. 4 is a front elevation of it.

The horizontal bars A, which carry the hanger bars, are, in the arrangement shown, six in number, and round in cross section. The round shape is found to answer well in practice. The cast-iron pockets B, carrying the ends of the horizontal bars, are built in the side walls C of the furnace, and are made with open tops projecting beyond the faces of the side walls, to receive the ends of the horizontal bars and permit



Gibbons and M'Ewen's Fire-Grate Bars.

of their being readily removed or replaced. The hanger bars D are arranged to hook on to the horizontal bars and to rest on the front of the next hanger bar below. These hanger bars are narrow, and fit together side by side where they rest on the horizontal bar. They are hook-shaped underneath to fit on the horizontal bars, and below this part they are made much narrower; so that there is an air space E between the lower portions of every two hanger bars. Each of the hanger bars is made with a parallel sided top part F projecting at the front of the grate; and the top parts together form a shelf in the front of the next row of vertical hanger bars, so that when it is desired to close-up portions of the fire ashes can be banked-up on the shelves formed for this purpose.

In order that the water which runs down the hanger bars to keep them cool shall properly flow down from end to end, they are each made on the fire surface with a longitudinal groove leading from a recess in the top part of the hanger bar, on to which water drips from a superimposed channel section water-trough furnished with a series of slots or grooves at the same distances apart as are the centres of the hanger bars, and down which water will drip on to the hanger bars and run down their central grooves.

By merely gripping the front projecting shelf part F of any hanger bar with a pair of tongs, it can be lifted off its horizontal bar and removed without displacing any of the other hanger bars, with the exception of slightly disturbing the next hanger bar above it. When desired all the hanger bars in any of the rows can be lifted off the horizontal bars and removed, and the latter can be lifted out of the pockets—leaving a perfectly clear passage into the furnace.

APPLICATIONS FOR LETTERS PATENT.

22,226.—WILKINSON, G., "Automatic control of temperature." Nov. 9.

22,425.—GLASGOW, A. G., "Heating retorts." A communication from John M. Rusby. Nov. 12.

22,449.—BREEDEN, J., AND CO., LIMITED, and BREEDEN, F. V., "Water and gas taps for geysers." Nov. 13.

Southport Gas-Works and German Trade.—At a meeting of the Southport Town Council on Monday, the 9th inst., Alderman O'Regan asked for information concerning the recommendation of the Gas Committee [*ante*, p. 323] that the tender of the Chemical Engineering Company and Wilton's Patent Furnace Company for a coal-tar installation for the sum of £2672 be accepted, together with the sum of £231 for excavations, &c., to be carried out by the Gas Engineer (Mr. John Bond). The information asked for was given by Alderman Trounson, who said he believed that the coal-tar installation would cost only £2000. The reconstruction of the plant was under consideration some two or three years ago. The matter had, however, remained over from time to time; and it had now been brought up under circumstances chiefly caused by the war. For obvious reasons he did not wish to go into details. The Government, it was understood, were encouraging all authorities who were desirous of doing so to take as much German trade as they could; and apart from the possibilities of development in the way of further dealing with residuals and getting light oils, &c., they would save about £150 a year in labour alone. The matter had been thoroughly discussed in Committee, and they were assured it would be a wise expenditure. The minute was confirmed.

MISCELLANEOUS NEWS.

HALIFAX MUNICIPAL UNDERTAKINGS.

Increased Sale of Gas.

On his re-election as Mayor, at the annual meeting of the Halifax Town Council, Alderman Ingham made a lengthy statement with regard to the progress of the borough. He remarked that the trading undertakings of the Corporation were giving a satisfactory return to the ratepayers, and the aggregate capital of the gas-works, electricity works, tramways, water-works, and markets was £2,700,894. On this capital a gross profit of £139,349 was earned during the last financial year, and represented 5·12 per cent. on the capital expenditure of the undertaking.

The most gratifying feature in connection with the Gas Committee, he went on to say, was the continued increase in the demand for gas. The sale of gas for the year 1912-13 amounted to 814,000,000 cubic feet, which, valued at 2s. per 1000 cubic feet, would be equal to a revenue of £81,400. The sale for the year 1913-14 amounted to 832,000,000 cubic feet, which, at the same price, would represent a revenue of £83,200. This increase was largely due to the popularity of the new hygienic gas-fires and of gas-cookers, which were being provided by the Corporation and supplied to consumers on reasonable terms. The increase shown, however, did not reflect the full value of the new business brought to the department by the introduction of the new appliances. The undertaking had suffered considerable losses in other directions, due to the displacement of gas, particularly for power purposes. New customers were being sought, and found, in all directions—notably for heating and lighting, for which purposes gas had a large and lucrative field before it. The sale of gas for heating and lighting purposes was on the increase throughout the country. Unfortunately, there had been a large increase in the price of coal during the year. In 1912-13 coal cost £36,700; whereas in 1913-14 the cost was £43,600. The receipts from residual products did not rise in sympathy with coal. The price of sulphate of ammonia fell, with the result that the net cost of coal, after deducting residual products, showed an increase of £9600 over the previous year. This great increase in expenditure, together with a large increased charge for ordinary rates, had reduced the surplus profits of the undertaking for the time being. The amount paid in ordinary rates in last year's accounts was £9831, as compared with £6540 in the previous year. An appeal against this assessment had, of course, been lodged. The Gas Department had for many years been paying for all new plant, apparatus, and distributing mains and appliances entirely out of revenue. The wisdom of this policy had been proved; but expensive renewals now under contemplation would require to be provided for by spreading the payment over a few years. It would not be fair to charge a single year with renewals of an extraordinary nature, which should, in the ordinary course, have been attended to and paid for out of the profits of past years. During the last twelve months obsolete plant standing in the assets of the gas-works undertaking at the unextinguished value of £2190 had been sold by tender for £190. The difference between these two sums had been provided for out of revenue. It was the purpose of the Gas Committee to pursue this policy until the capital account of the undertaking had been reconstructed on sound business lines.

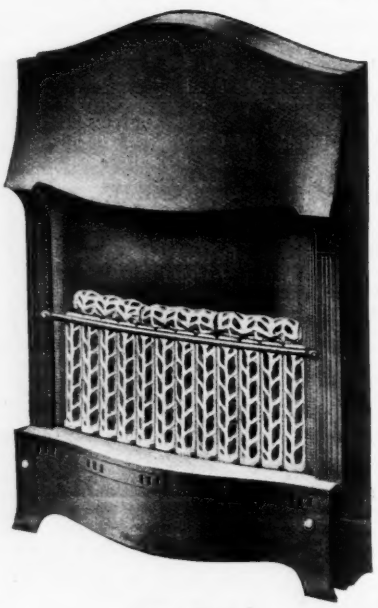
ORIENTAL GAS COMPANY, LIMITED.

The Ordinary General Meeting of the Proprietors of this Company will be held to-morrow (Wednesday), for the purpose of receiving the report of the Directors and the accounts for the twelve months ended June 30 last, and of declaring the dividend recommended by the Board —4½ per cent. (free of income-tax), making a total dividend of 8 per cent. for the year.

The report to be submitted states that the amount of the gas-rental is lower—a natural result of the changed conditions of the Company's new contract with the Corporation of Calcutta for the public lighting, whereby the Corporation provide, at their own charge, certain elements of the service, which, under the old contract, were provided by the Company for the Corporation, and were repaid by the Corporation to the Company in the gas-rental. On the other hand, the expenditure side of the revenue account is proportionately lightened by the cessation of this disbursement by the Company. The amount yielded by the residual products shows a reduction; the markets having developed weakness in the financial year, as compared with the preceding twelve months, when they were exceptionally firm. The rate of exchange was favourable throughout the year's transactions; and the "Exchange Equalization Account" has benefited accordingly. The general operations of the Company, although incommensurate in magnitude with those of some recent years, have been interesting and important. They include the laying of new mains in new districts of the Metropolis, in response to public demand—an extension which should bear the fruit of profitable business. Economical and efficient working has been materially promoted by the erection inside the works at Sealdah of a building within which will now be concentrated the distribution department (hitherto located some distance away), the stores department, the accountancy and general offices, &c.—all under one roof. Money, time, and labour will thus be saved by improved control and by rapid despatch facilitated by the close intercommunication of the various branches. The outlay incurred in respect of these operations, together with the provision of plant, machinery, and other material, amounted to nearly £8800; the whole being of the nature of capital expenditure. But, "in accordance with the established policy of the Company to spare the capital account as much as possible, the Directors have charged £4000 of the amount expended to the reserve fund, and have defrayed the balance out of the revenue of the year."

ARDEN HILL'S VENTILATING GAS FIRE.

TESTED AND FOUND HYGIENICALLY PERFECT.—*See "Lancet," July 11, 1914.*



No. 5117.

The "GNOME"

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GREENOCK GAS-WORKS.

Reconstruction Scheme.

The reconstruction of the Greenock Gas-Works is now in its final stages. A very extensive scheme was taken in hand, and has occupied a considerable time. The old gas-works at Inchgreen had to be completely remodelled, and new plant installed. The work included the building of vertical retorts, the construction of a million cubic feet gasholder, and the arranging of new show-rooms.

The steel tank for the new lattice standard-guided gasholder is making progress; and the tank is completed up to the fourth ring of plates, with the fifth and sixth in hand. An excavation 13 ft. 6 in. deep was necessary for the tank; and, on account of the close proximity to the Firth of Clyde, doubt was occasioned as to whether or not the bank would stand. The work was, however, carried through successfully; and the foundation of 18 inches of concrete, reinforced with expanded metal, was put in position in due course. The old tank, which had been forty years in place, is close to the site of the new one; and to safeguard against any trouble, a curved retaining wall was built of brick and cement, with heavy buttresses, to afford some support for a distance of 70 feet where the circumference of the two tanks most closely meet.

In the power-house there are three new British-Westinghouse generating sets, consisting of three gas-engines of 42 maximum B.H.P., running at 240 revolutions per minute, direct coupled by flexible coupling to shunt-wound protected type generators; and the current will be distributed to the various motors at 440 volts. The chimney has been lengthened to 150 feet; and dampers have been inserted in the main flue, so that the waste gas can be diverted through the flues of a boiler if desired.

The Woodall-Duckham vertical retorts, which are now under fire, have taken some time to erect; but ample allowance has been made for increased demand for gas in years to come. They are of 2 million cubic feet per day capacity, and are on an indented bar foundation. The plant is complete with hydraulic waggon-tipper, coal breakers, screens, elevators, tipping-tray conveyors, and telpher track.

The new show-rooms have a position in the leading business thoroughfare of the town. They are fitted up with rooms to display different types of lighting and heating apparatus; and in a large room in the rear furnaces are shown, and cookery lessons given. A certificated lady cook has been appointed to advise the consumers in the use of the gas-cooker. Semi-direct fittings are employed for lighting the inside of the rooms; and four 1500-candle power Keith high-pressure lamps illuminate the frontage.

The Greenock Gas Department have had more work than they could undertake all the summer. There are now approximately 11,000 cooking appliances out on free loan among the 16,500 consumers on the books.

THE LIGHTING OF LONDON.

At a meeting of the Bermondsey Borough Council on Friday, Mr. A. Layman inquired whether any new regulations were to be enforced regarding the lighting of the streets of the borough. He understood that the Home Secretary had issued an order somewhat relaxing existing conditions. The shopkeepers and street traders of the borough were complaining of the inadequacy of the street lighting. He moved that the Town Clerk be instructed to write to the Commissioner of Police calling his attention to the new regulations of the Home Office, and asking permission to at once increase the power of the lights. In seconding, Mr. W. J. Delderfield said he thought the officials should be instructed to turn up the street lights immediately, and take the risk. The police might "turn a blind eye" to the arrangement. Owing to the absence of proper lights in the streets, more persons were knocked down and injured than if they were assailed by a whole army of Zeppelins. The market places in the borough were a farce; and the shopkeepers had been penalized through the scare that was created by the Public Departments. The resolution was unanimously carried.

At a meeting of the Balham and Tooting Traders' Association, Mr. T. B. Ball drew attention to the manner in which the lighting regulations were being carried out by the traders of Balham. He maintained that different policemen on point duty had their own pet ideas as to the observance of the orders, with the result that some shops were much more brilliantly lighted than others. Mr. A. E. Parnell thought they should ask the Chief Commissioner of Police to appoint an investigator to inquire into the reason why so many traders had not fallen into line, and why the various districts were treated differently. The Chairman (Mr. Harry F. Cusden) remarked that, while he could not say anything about the lighting of the shops at Tooting, he could say that the Charing Cross district was absolutely dangerously dark. The streets of Balham and Tooting were quite light in comparison. It was resolved to call the attention of the Chief Commissioner of Police to the fact that many traders were not observing the spirit of the order in the same manner as others.

THE REDUCED PUBLIC AND PRIVATE LIGHTING.

Referring to this subject last Saturday, under "Gas Notes," the "Ironmonger" said:

Everywhere one hears the remark that the reduced-light order must have hit the lighting trades very hard in the Metropolis and other localities affected. It is more than probable, however, that the diminished public lighting *per se* is of less consideration to the gas companies than the falling-off in some other branches of their trade. The gas companies no longer have the monopoly of public street illumination, and where they retain it the consumption of gas is so reduced by the substitution of incandescent for flat-flame burners that it does not con-

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stitute such an important part of the total gas consumption of even the best-lighted town areas as the far less brilliant ancient system did for so many years. Mention of the obsolete flat-flame lights awakens the reflection that actually the force of circumstances has brought about a return of comparative dimness of the public streets and suburban roads to what was the usual thing less than twenty years ago. It is a little difficult to realize that what arouses the ire of wayfarers struggling with the difficulty of discerning the numbers of motor-'buses and the labels on electric tram cars was the regular state of public street lighting so recently. Then, however, the traffic conditions were less exacting. The ordinary public street-lamps in their half-mourning are yet far and away more helpful to the rapid traffic conditions of the time than the old flat-flame lighting would have been. One can perceive this by observing the far-flung rays on a wet road surface of those lamps which remain alight. Half-obscured lamps, at twice the ordinary spacing, are infinitely better than none. The question has been raised as to how much, if any, loss to the nation has ensued from this darkening of the ways of certain towns, with London and its vast suburbs at their head. Some aver roundly that the Metropolis alone has dropped thousands over it; while others as confidently maintain the contrary, and declare that the admitted inconvenience has little cash equivalent. It is otherwise, so far as the lighting by either gas or electricity is concerned, in regard to the earlier closing hours of shops, houses of call, and places of public resort. Here, no doubt, there is going to be a considerable loss of revenue for the lighting industries concerned; but, even so, there is already evidence to prove that the effect will not be a simple one, nor be other than partial and local. Not to pursue the general question, it may be plausibly argued that even where they have not gained an increase of consumption as usual, or have suffered a decrease, the gas companies are not necessarily losing money. Moreover, where the consumption is a matter of necessity, as it is in the less showy or fashionable areas, there is quite likely to be a positive increase.

METROPOLIS WATER SUPPLY.

Additional Works for South and North London.

At the last Meeting of the Metropolitan Water Board, they resolved to apply to Parliament for powers to increase the existing supply of South London by a further 15 million gallons per day. The project involves an estimated expenditure of £519,200, and embraces the laying-down of a 42-inch main from the pumping-station at Walton for a distance of 15½ miles to the reservoirs at Brixton, and thence to Honor Oak, near Nunhead—a total length of about 21½ miles—along a route which crosses the Mole, Ember, and Wandle. This scheme is supplementary to the works undertaken by the Board a few months ago, under their Act of 1911, for the construction of two new reservoirs at Littleton, near Laleham, with a capacity of 3500 million gallons apiece, and having their intake, of 135 million gallons daily, at Penton Hook, near Staines. For these two reservoirs, and for a third to be constructed hereafter at Staines, the plans and designs were made by the late Mr. W. B. Bryan, the Board's Engineer-in-Chief. The water will flow by gravity through a 7-feet steel main to new filter-beds, for which a site of about 40 acres is appropriated at Kempton Park, whence it will be conveyed to a new high-level service reservoir at Cricklewood, at an altitude of 270 feet above Ordnance datum, and having a capacity of from 20 to 25 million gallons. From this reservoir will be laid high-level mains to Kilburn, Willesden, Shoot-up Hill, and Ealing. It is anticipated that one of the two reservoirs at Littleton will be completed in three years from now. The outlay upon these works and the distributing system is computed to be nearly £2,283,000, and the total of the authorized scheme, under the Act, at £3,481,000. The provision to be made is for a population of 7,750,000.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

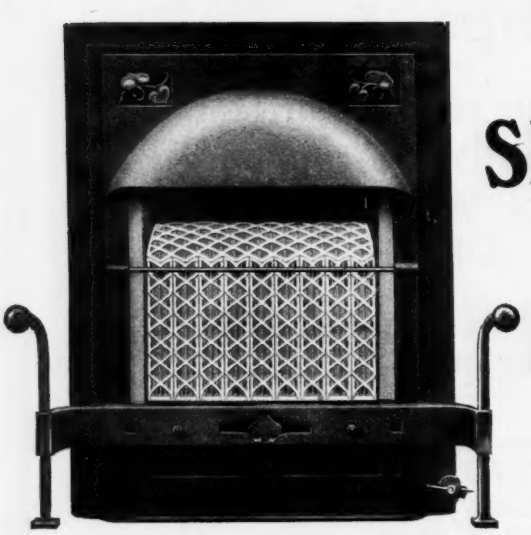
A sign of movement in the direction of gas legislation for Scotland next session appeared last Wednesday by the announcement of the intended application to Parliament by the Cowdenbeath and District Gas Company, Limited, for authority to dissolve and reincorporate. The existing works are to be maintained and extended. The application will be made to the Secretary for Scotland, under the Private Legislation Procedure Act of 1899; and the Order will contain provisions in regard to the quality and pressure of gas, the means and methods of testing it, and the price or prices to be charged for it. Provision will also be made as to the calorific value of the gas supplied by the Company; and it is proposed that certain sections of the Gas-Works Clauses Act, 1871, shall, as applied to the Company, be construed as if calorific value were referred to in lieu of illuminating power. Additional capital and borrowing powers will be asked for.

Application is also to be made for a Provisional Order by the burgh of Port Glasgow; and the petition will be before the Secretary for Scotland on the 17th prox. Authority is asked for the construction of new gas-works, and the establishment of works for the manufacture, conversion, and utilization of residual products on lands fully described in the application. Under the Order, the town will manufacture and sell coke, coal tar, ammoniacal liquor, and all other residuals.

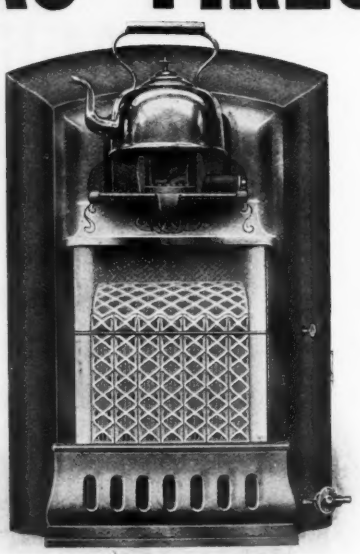
The proposal to connect the Perth gas system with the gas-works belonging to Messrs. Lumsden and Mackenzie at Almondbank, to which reference has already been made in these "Notes," has now matured. The agreement between the Town Council and the firm has been adjusted, so that within a very short period Almondbank and the district will be supplied with gas from Perth. The cost of laying the main is understood to be estimated at something like £1300. Petitions have also been submitted from householders at Pitcairngreen and West

"IN PLACE OF THE SUN."

WILSON "SOLA" GAS FIRES.



SILENT AND HOT.



The "ASTOR." The "REGIS."

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Huntingtower, asking the Council to give them the benefit of the Perth gas. Meanwhile, however, the Gas Committee desire more information, and have delayed coming to a decision pending further inquiries. Should this extension be carried out, it is believed it will entail additional expenditure, between mains, meters, &c., of nearly £500.

The scheme for augmenting the Kirkconnel water supply, which includes the laying of a new track from Kello water to the present main at Kellobank, has now taken practical shape. Mr. James Ritchie, of Dunfermline, has secured the contract for laying the main, at an estimate of £2622. The fixing of the mechanical filters and filtration plant has been secured by Paterson's Engineering Company, Limited; and the reinforced cement tank will be built by Gray's Ferro-Concrete Company, Limited. The whole scheme is estimated to cost £4500.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Nov.* 23.

Inquiries for tar and pitch for road work are now being made for the coming season, which should have a steadying effect on prices. Shipments are also being made on account of business already done, and new sales are reported. The price is fairly firm at 30s. per ton net, in bulk, at works. Some sales of benzol have been made for export, and there is also a certain outlet for this product at home for Government purposes. There is considerable activity in toluol and crude carbolic acid; the latter being firm at 3s. 1d. to 3s. 2d. per gallon net, casks free, for 60's. Solvent naphtha is quiet. Creosote is firm at 4d. per gallon net, in bulk, alongside export steamer. Pyridine bases are 8s. to 8s. 3d. per gallon net into buyers' packages. Anthracene, 40-45 per cent., buyers at 2d. per unit net, casks free.

There is no change in sulphate of ammonia; makers' price for 25 per cent. quality remaining steady at £10 17s. 6d. per ton net and naked at works.

Tar Products in the Provinces.

Nov. 23.

There have been one or two alterations in the markets for tar products during the past week. Benzols have remained very quiet; but there is no alteration in the price. There is very little business doing in either solvent or heavy naphthas. In crude carbolic good business has been done, and as much as 3s. 1d. per gallon has been paid for the 60's quality. Toluol is very firm; prices ranging from 2s. 6d. to 2s. 9d. per gallon. Creosote is unchanged.

The average values during the week were: Value of liquid products in one ton of tar, 16s. 6d. to 18s. Benzol, 90 per cent., naked, North, 8½d. to 9d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 6d. to 2s. 8d. Crude naphtha, in bulk, North, 5½d. to 6d. Solvent naphtha, naked, North, 8½d. to 9d. Heavy naphtha, naked, North, 11d. to 1s. Creosote, in bulk, North, 3⅜d. to 3⅝d. Heavy oils, in bulk, 4d. to 4½d. Carbolic acid, casks included, 60 per cent., East and West Coasts, 3s. to 3s. 1d. Naphthalene, £4 10s. to £10; salts, 60s. to 65s., bags included. Anthracene, "A" quality, 2d.; "B" nominally ¾d.

Sulphate of Ammonia.

LIVERPOOL, *Nov.* 21.

During the past week the market for this material has taken a distinct turn for the better, and a considerable volume of business has been done at steadily advancing prices. The requirements have largely been for account of middlemen, but there has also been a fair demand from the Colonies. The nearest values at the close are £10 17s. 6d. per ton f.o.b. Hull; £11 per ton f.o.b. Liverpool, and £11 2s. 6d. per ton f.o.b. Leith. In the forward position, the tone is also firmer, and manufacturers report that they have realized £11 5s. per ton f.o.b. at the ports for January-June delivery in equal monthly quantities.

Nitrate of Soda.

This market is unchanged, and holders on spot repeat quotations at 9s. 6d. per cwt. for ordinary, and 10s. 1½d. for refined quality.

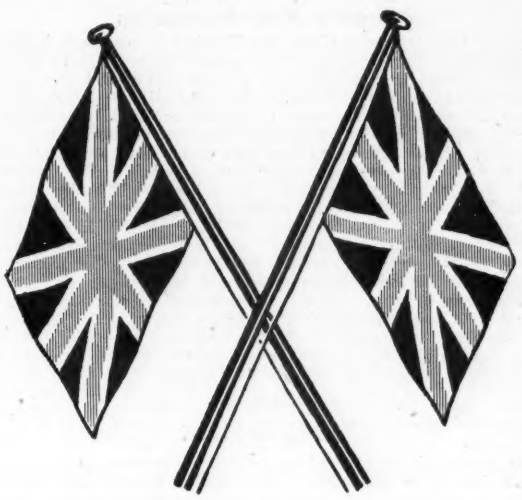
Sulphate of Ammonia.

From another source it is reported that the market for this article has been very quiet during the past week, and lower prices are reported to have been accepted at some ports. Outside London, makes to-day are quoted at £10 per ton; Hull, £10 12s. 6d.; Liverpool, £10 15s.; Leith, £10 17s. 6d.; Middlesbrough, £10 12s. 6d. to £10 15s.

COAL TRADE REPORT.

Northern Coal Trade.

Though the demand for some classes of coal is fuller, yet the export trade is checked by the high rates of freight. A year ago, for instance, about 8s. per ton was paid for coal from the Tyne to Genoa. This year over 18s. per ton has been paid. In the same way, a year ago coal from the Tyne to London was about 3s. 3d.; it is now over 5s. 6d. Obviously, such marked changes influence the shipments of gas coal so freely sent to these ports. In steam coals, best Northumbrians are from 13s. per ton f.o.b.; second-class steams are near 10s. 10½d. per ton; and steam smalls are from 7s. 6d. to 8s. 9d. per ton—the latter being rather scarce at the moment. In the gas coal trade, the demand is heavier, both for home requirements and for France and Italy; but for oversea, the business is impeded by the high delivered cost of the fuel. Best Durham gas coals are steady at 12s. 6d. per ton f.o.b.; second-class kinds are near 11s. per ton; and "Wear Specials" are in good inquiry at 13s. per ton f.o.b. For most classes of coal, slight concessions in the price will be made where prompt steamers can be offered; the scarcity of tonnage making many collieries unable to keep fully at work, even with good order books. Coke is steady, but plentiful. For good gas coke, the price varies from 11s. 6d. to 12s. 3d. per ton f.o.b. on the Tyne.



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Disputed Meter Registration.

At the Lewes County Court, on Monday of last week, before his Honour Judge Mackarness, the Lewes Gas Company sued a consumer named Herbert Starnes for £1 10s. 4d., balance due for gas supplied. On behalf of the Company, Mr. E. Wellsted said the defendant questioned the accuracy of the meter; and the sum claimed represented the amount of gas unpaid for, which the defendant contended he did not consume. Stephen Price, an employee of the Gas Company, stated that he tested the meter, and found it registered correctly. Defendant told him he had a nurse attending his sick wife. The Manager (Mr. Edward Jones) said he had the meter officially tested, and it was certified correct. It had not been tampered with since it left the house. Defendant accepted this statement; and the Judge thereupon remarked that he failed to see what the defence was. Defendant replied that an employee of the Gas Company agreed with him that, on the face of it, the meter was at fault. They took one meter out which was registering 4 feet an hour, though the fittings were tight; but when the new one was placed in position, it registered nothing. He admitted, however, that he was not present when the meter was changed. His Honour gave judgment for the amount claimed.

Strike at Neath.

The men employed by the Neath Corporation, numbering 150, came out on strike on Friday night. The notices of the men were due to expire on the following day; but their action in coming out was precipitated by a notice asking them to bring in their tools. The whole of the men are members of the Municipal Employees' Association; and they are demanding an increase in wages. Among the strikers are, of course, the gas workers. With the view of meeting the difficulty, the Town Council, through the Free Labour Association of Manchester, brought some men into the gas-works; but by ten o'clock on Saturday night the gas supply of the town was exhausted. All the streets, except those where there were shops having the electric light, were in darkness. Some of the tradespeople had oil-lamps and candles ready; but the majority believed that the supply of gas would last out Saturday night. Sunday morning presented the difficulty of a want of gas for cooking purposes. At night, with only two exceptions, the services in the churches and chapels were conducted by candle light. The tramway service, which is worked by gas power, was entirely suspended during the day. It appears that the gas stokers are not asking for an increase, but only the roadmen and general labourers and fitters. A deputation from the Municipal Employees' Association, headed by Mr. Rees Llewelyn, the General Secretary, waited upon a Special Committee of the Town Council on Thursday evening, with the result that, after a full hearing, a resolution was passed in which the Committee expressed the opinion that the rates of wages paid in Neath compare favourably with those paid to workmen of similar classes in towns or districts of the same kind as Neath; and, having regard to the serious crisis through which the nation is now passing, they considered that no general increase of wages could be recommended. If, however, any individual cases of hardship were brought to the notice of the Council, they would be sympathetically considered. The Committee hoped that the notices served by the men would be forthwith withdrawn. The resolution, which was confirmed by the Council, was read to the deputation. Mr. Llewelyn said he was sorry for the decision, but the men would not withdraw their notices.

Dewsbury Gas for Emley.—The Dewsbury Corporation have entered into an agreement with the Emley Urban District Council to supply the Council's area with gas at 4s. 4d. per 1000 cubic feet in the case of prepayment meters, 3s. 8d. for ordinary meters, 3s. 2d. for cooking purposes, and £2 per lamp for 1750 hours per annum for public lighting.

Explosion at the Oldham Gas-Works.—An accident occurred at the Oldham Central Gas-Works in the early hours of Wednesday last. Two stokers named Hebden and Ubbard were doing some work on one of the retorts when an explosion took place, and both men were burned rather severely. They were conveyed with all speed to the Royal Infirmary, and at the week-end were reported to be making satisfactory progress.

London County Council's Electricity Scheme.—At the meeting of the London County Council last Tuesday week, it was decided to proceed with the large electricity supply scheme of which particulars have been given in the "JOURNAL." A Bill will accordingly be promoted; and the "Municipal Journal" understands that it will be taken to the second reading and Committee stages if the prospects of success are good. If, however, the opposition is very strong, Parliament will be asked to carry over the Bill to the session of 1916.

A Geyser Fatality at Canterbury.—A verdict of "Death from suffocation due to faulty fixing of the geyser and lack of ventilation," was returned by a Coroner's Jury at Canterbury, who inquired into the death of Rifleman Harry Bunner. Deceased was seen on Sunday afternoon to enter the bathroom of the house in which he was billeted; and as he did not appear again, a comrade burst the door open, and found him lying on the floor, having apparently been overcome while making an effort to reach the door. The room was full of vapour, and the windows were closed. Artificial respiration was tried, but without success. It was stated that a geyser in the bathroom had "occasionally exploded" when wrongly lighted.

Chapel, Whaley, and District Gas Company.—The report of the Directors of this Company for the year ended the 30th of September shows a profit, with the addition of the unappropriated balance of £600, of £3308. Deducting the bank interest, there is left a sum of £2963, which the Directors recommend should be disposed of as follows: Dividend at the rate of 5 per cent. per annum (less tax), £1997; addition to the special purposes fund, £229—making together £2226, and leaving £736 to be carried forward. The growth of the business has continued satisfactory; and the Engineer and Manager (Mr. E. Meunier) reports that the manufacturing and storage stations were maintained in efficient working order during the year.

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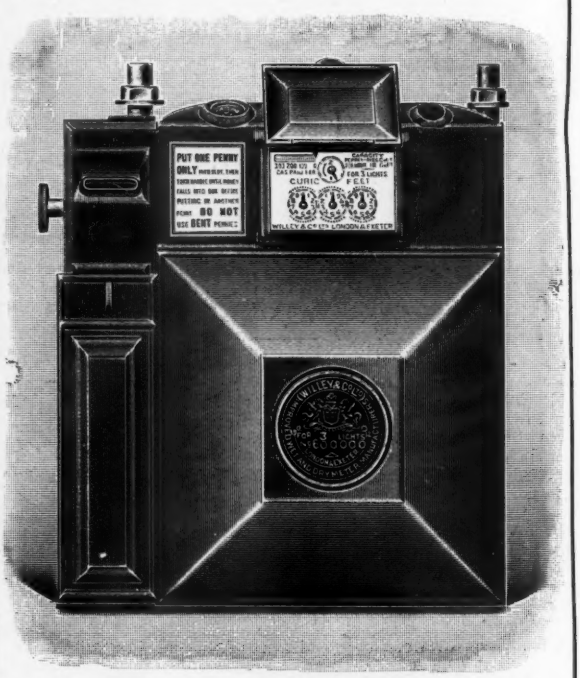

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The Richmond Gas Stove and Meter Company have secured the contract from the Metropolitan Asylums Board for the installation of a large number of gas-stoves, in substitution for the existing coal ranges in the kitchens at the Grove Hospital. In our issue for the 3rd inst. (p. 262) it was reported that an estimate had been made that the installation would effect a saving of £120 per annum.

The Bryan Donkin Company, Limited, of Chesterfield, have issued a neat little pamphlet giving particulars and illustrations of their rotary blowers, compressors, and exhausters, which are made in capacities varying from 100 to 500,000 cubic feet per hour. The advantages and features are stated to be the absence of all valves, simplicity of construction and small number of working parts (with very little repair and overhaul necessary); the working parts entirely enclosed, no adjustment of working parts required, good efficiency, and silent working.

There were recently heard in the Patents Court applications regarding the use of the word "Lysol" and the trade marks, in connection with a German preparation; and the Comptroller of Patents stated that the Board of Trade had come to the conclusion that the name "Lysol" as a trade mark should be expunged from the Trade Mark Register. It was the name of a preparation which was perfectly well known, and which ought to be open to British chemists to make. There was a large demand for it. Messrs. Thomas Horrocks and Sons, Limited, of the Albert Chemical Works, Miles Platting, Manchester, announce that they are now making "Lysol."

The Local Government Board have sanctioned the borrowing by the Chorley Town Council of £18,750 for the installation of vertical retorts and a new condenser.

Netley Hospital, Southampton, is heated very largely by gas-stoves; and 95 of Clark's syphon stoves have been installed. These stoves are also heating the Military Hospital at Norwich, and one of the hospitals at Great Yarmouth.

A list just received by them from the Page-Hersey Iron, Tube, and Lead Company, Limited, of Toronto, has been forwarded by Messrs. Glover Edwards and Co., of No. 8, Laurence Pountney Hill, E.C., who are their sole agents for Great Britain, home and export. At the present moment, when Canada is also helping in the military operations of this country, it is specially interesting to note that she is joining in the determined effort that is being made to secure as much as possible of the trade that has of late years gone to Germany. In the London warehouse, the firm are carrying a large stock of tubes in both English standard gas and steam weights; and they have facilities for cutting and threading pipe from ⅛ to 6 inches diameter. The works are at Guelph, at Welland, and at Fort William—all in Ontario. The works at Welland (of which a number of photographs appear in the list) are new, and are stated to include two of the most perfect and up-to-date tube-making plants in the world. There are being made at these mills butt-welded and lap-welded tubes. It is, in fact, the firm point out, the only works in Canada making lapwelded tubes.

GAS COMPANIES IN THE STOCK EXCHANGE.

Last week some material advance was made in the removal of the obstacles that bar the way to the reopening of the Stock Exchange. It must, however, be borne in mind that the complete resumption of "business as usual" cannot be expected to be attained for perhaps a considerable period, and that the way to the door of the House must be trodden with extreme caution. The favourable factors of the past week were the satisfactory accomplishment of the settlement and the assurance that the War Loan would prove a big success. As to the first-named operation, it was not wholly free from some pin-pricks, but the scratches were not deep or deadly. The cheerfulness thus engendered was fortified by the situation of warlike operations, especially on the Western front, where the British and their Allies have for five weeks presented an irrefragable stone-wall to the German advance. Transactions were neither large nor numerous, but prices showed an improved firmness. As regards gas undertakings, Messrs. A. & W. Richards, at the Mart last Tuesday, placed for the Aldershot Gas and Water Company an issue of ordinary stock at rather higher than a 5½ per cent. for money price, and an issue of preference stock at a fraction under 5 per cent. A small quantity of Uxbridge ordinary was at the same time sold at the same rate as the Aldershot ordinary, and some debenture stock to return a fraction under 4¾ per cent. for money. The ease in the Money Market was more pronounced than ever; money being at times unlendable.

Bank rate (fixed Aug. 8) 5 per cent.; last year, 5 per cent.

OFFICIAL QUOTATIONS AT THE CLOSE OF THE STOCK EXCHANGE ON JULY 30.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59–64	..	3 18 2
374,000	,,	July 10	4	Do. 4 p.c. Deb.	76–79	..	5 1 3
380,000	5	April 29	7½	Bombay, Ltd.	5¼–6⅝	..	5 17 8
50,000	10	Feb. 26	16	Bourne- 10 p.c.	29–30	..	5 6 8
373,480	10	,,	7	mouth Gas B 7 p.c.	15–15½	..	4 10 4
95,000	10	,,	6	and Water Pref. 6 p.c.	13½–14	..	4 5 9
380,000	Stk.	Feb. 26	14	Brentford Consolidated	261–266	..	5 5 3
380,000	,,	,,	11	Do. New	204–209	..	5 5 3
50,000	,,	,,	5	Do. 5 p.c. Pref.	109–111	..	4 10 1
206,250	,,	June 11	4	Do. 4 p.c. Deb.	91–93	..	4 6 0
217,380	Stk	Feb. 26	11	Brighton & Hove Orig.	208–213	..	5 3 4
244,200	,,	,,	8	Do. A Ord. Stk.	154–159	..	5 0 8
530,000	20	Mar. 26	12½	British	44–45	..	5 11 1
190,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88–92	..	4 8 11
345,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85–87	..	4 2 0
100,000	10	–	–	Cape Town & Dis., Ltd.	1½–2½	..	—
100,000	10	–	–	Do. 4½ p.c. Pref.	4–6	..	—
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70–75	..	6 0 0
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord.	108–110	..	4 10 11
1,513,280	Stk	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106–108	..	5 1 2
560,000	,,	,,	5½	Do. 3½ p.c. do.	103–105	..	5 1 6
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	69½–71½	..	4 3 11
800 000	Stk	,,	4	Continental Union, Ltd.	76–79	..	5 1 3
200 000	,,	,,	7	Do. 7 p.c. Pref.	115–118	..	5 18 8
492,270	Stk.	—	6	Derby Con. Stk.	123–125	..	4 16 0
55,000	,,	–	4	Do. Deb. Stk.	102–104	..	3 16 11
1,092,180	10	July 29	10	European, Ltd.	17½–18*	..	5 11 1
16,264,910	Stk.	Feb. 12	4/17/4	Gas 4 p.c. Ord.	98–102	..	4 15 6
2,600,000	,,	,,	3½	Light 3½ p.c. max.	76–79	..	4 8 7
4,062,235	,,	,,	4	and 4 p.c. Con. Pref.	96–99	..	4 0 10
4,674,850	,,	June 11	3	Coke 3 p.c. Con. Deb.	72½–74½	..	4 0 6
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87–89	..	5 12 4
70,000	10	April 29	17	Hongkong & China, Ltd.	16½–16⅝	..	6 11 4
131,000	Stk.	Mar. 12	' ⅞†	Ilford A and C	151–154	..	5 2 4
65,780	,,	,,	6⅞†	Do. B	115–118	..	5 8 0
65,500	,,	June 26	4	Do. 4 p.c. Deb.	92–94	..	4 5 1
4,940,000	Stk.	May 14	9	Imperial Continental	150–160	..	5 12 6
1,335,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84–86	..	4 1 5
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c.	119–121	..	5 7 5
561,000	Stk.	Feb. 26	10	Liverpool United A	211–213	..	4 13 11
718,100	,,	,,	7	Do. B	146–148	..	4 14 7
806,083	,,	June 26	4	Do. Deb. Stk.	97–99	..	4 0 10

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
75,000	5	June 11	6	Malta & Mediterranean	4⅛–4⅜	..	6 9 9
250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.	99–101	..	4 9 1
541,920	20	May 28	4	Monte Video, Ltd.	11½–12	..	6 13 4
1,775,892	Stk.	July 29	4½	Newc'tle&G'tesh'd Con.	98½–99½	..	4 10 6
529,705	Stk.	June 26	3½	Do. 3½ p.c. Deb.	82–83	..	4 4 10
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14–15	..	5 2 8
300.000	Stk.	May 14	8	Oriental, Ltd.	117–122	..	6 11 2
60,000	5	Mar. 26	10	Ottoman, Ltd.	7⅛–7⅜	..	6 9 0
60,000	50	Feb. 26	13	Portsea, Island B	128–131	..	4 19 3
100,000	50	,,	12	Do. C	118–121	..	4 19 2
249,980	5	April 29	8	Primitiva Ord.	5¼–6	..	6 13 4
499,960	5	June 26	5	,, 5 p.c. Pref.	4⅜–5	..	5 0 0
521,600	100	June 2	4	,, 4 p.c. Deb.	9½–93	..	4 6 0
346,194	Stk.	June 26	4	River Plate 4 p.c. Deb.	85–87	..	4 12 0
150,000	10	May 14	6	San Paulo 6 p.c. Pref.	10⅛–11	..	5 9 1
125,000	50	July 1	5	5 p.c. Deb.	47–49	..	5 2 0
135,000	Stk.	Mar. 12	10	Sheffield A	233–234	..	4 9 3
209,984	,,	,,	10	Do. B	232–234	..	4 9 3
523,500	,,	,,	10	Do. C	220–222	..	4 10 1
90,000	10	May 28	9	South African	10⅜–11½	..	7 16 6
6,429,895	Stk.	Feb. 12	5/9/4	South Met., 4 p.c. Ord.	111–113	..	4 16 8
1,895,445	,,	July 10	3	Do. 3 p.c. Deb.	72½–74½	..	4 0 6
209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157–159	..	5 6 11
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114–116	..	5 3 5
60,000	,,	,,	5	Do. 5 p.c. Pref.	110–112	..	4 9 3
137,058	,,	June 26	5	Do. 5 p.c. Deb. Stk.	116–118	..	4 4 9
629,740	Stk.	May 14	5	Southampton Ord.	99–102	..	4 18 0
120,000	Stk.	Feb. 12	7½†	Tottenham A 5 p.c.	135–138	..	5 8 8
742,275	,,	,,	6†	District B 3½ p.c.	115–117	..	5 2 7
181,255	,,	June 26	4	4 p.c. Deb.	87–89	..	4 9 11
182,380	10	Dec. 30	5	Tuscan, Ltd.	5–6	..	8 6 8
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93–95	..	5 5 3
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½–109½	..	4 11 4
				Wandsworth, Wimbledon, and Epsom—			
80,000	Stk.	Feb. 26	8⅜	Wandsworth A 5 p.c.	151–156	..	5 7 4
255,636	,,	,,	6¾	,, B 3½ p.c.	129–134	..	5 2 7
108,075	,,	,,	5/17/3	,, C 3½ p.c.	110–115	..	5 2 0
352,000	,,	,,	6½	Wimbledon 5 p.c.	117–122	..	5 0 5
98,000	,,	,,	6⅝	Epsom 5 p.c.	121–126	..	5 5 2
88,416	,,	June 26	3	3 p.c. Deb. Stk.	66–69	..	4 6 11

Prices marked * are "Ex Div." † Next Dividend will be at this rate.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c, Vacant.

Works Assistant. Torquay Gas Company.
Draughtsman. No. 5956.
Foreman. No. 5957.
Prepayment Meter Collector. Aldershot Gas, Water, and District Lighting Company.
Sulphate Makers. Portsea Island Gaslight Company.
Gas Fitters. Leicester Gas Department.

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Particulars to "Principal," Scripps's Advertising Offices, 13, South Molton Street.

Sales of Stocks and Shares.

Kingston Gas Company. Sun Hotel, Kingston. Dec. 10.
Lea Bridge Gas Company. London Mart, Dec. 1.
Reading Gas Company. By Tender. Dec. 9.
Southend Water Company. London Mart. Dec. 1.

TENDERS FOR

Coal.

Nottingham Corporation. Tenders by Dec. 3.

Fire-Clay Goods.

Leicester Gas Department. Tenders by Dec. 12.

General Stores.

Nottingham Corporation. Tenders by Dec. 30.

Lighting Goods for Street Lamps, &c.

Calcutta Corporation. Tenders by Feb. 15.

Pipes.

Leicester Gas Department. Tenders by Dec. 12.

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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Resists 4500° Fahr. Best for GAS-WORKS.
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